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AN EVALUATION OF THE NEWER OBSTETRICS*

Presidential Address

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OBSTETRICS has been conservative by heritage and tradition. In conservative days labor and delivery were safe in most cases, when allowed to follow a natural, unmolested course, and as a result were looked upon as normal physiologic processes. The role of the attendant was the giving of moral aid and psychic support to the patient. Thus midwives and untrained attendants had engaged in this practice from time immemorial. And because Nature is kind and efficient these attendants seemed successful, although they often knew very little of what was happening during labor and delivery. These midwives and untrained attendants often received credit beyond their just deserts, simply because Nature worked well. When a complication existed which no one recognized, it was unfortunate for the patient. In this midwife era few records were kept and we have little information as to what happened to those who were unfortunate enough to have a complication, but it is reasonable to assume that many of these unfortunates succumbed without anyone realizing what was wrong. There is great need for intelligent observation in the practice of obstetrics, even though the process of delivery may be physiologic, and no branch of medicine requires a higher intelligence and sounder judgment. Also, in no branch of medicine can the results of improper judgment be more grave.

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Medical men began to have access to the lying-in room in the seventeenth century and the advances made from that time on are a testimony of the importance of intelligent observation of normal labor and delivery. Here we find the earliest observations on deformed and contracted pelves, placenta previa, abnormal presentations, with descriptions of internal podalic version and maneuvers for the delivery of the aftercoming head, the introduction of the obstetric forceps, and the beginning of attempts to repair and minimize the damage that occurred during normal labor. In that earlier era medical men continued the conservative watchful waiting, now more fully cognizant of what conditions existed, but assisted Nature only when conditions were abnormal, or when prospect for a spontaneous ending was either long delayed or seemed absolutely impossible. In conservative practice, if a little longer waiting or continuation of labor promised a spontaneous delivery, then that was the procedure of choice. But even during this period, certain physicians, often inexperienced or untrained, attempted certain procedures to shorten labor, and hurried the delivery, at times seemingly for their own convenience. This consisted usually of attempts at delivery of the baby through an incompletely dilated cervix. This type of practice was spoken of as "meddlesome midwifery," and it was condemned by all conscientious physicians. This was the practice only of the unscrupulous who considered himself first and his patient last, or not at all.

During the last three decades marked changes have taken place in obstetric practice. These changes have been suggested not by indifferent practitioners, but by the skilled leaders and students of obstetrics. They felt that labor was too often pathologic and that the policy of watchful expectancy had much in it to be criticized and it was pointed out that so-called normal physiologic labor could be productive of great harm to both mother and child. Also they argued that the pain of labor could have a very nerve-racking effect on the mother, and a prolonged second stage of labor could result in irreparable damage to both mother and child. Let us again emphasize the fact that these ideas were promulgated by some of our leading and most respected obstetricians. They felt that the properly trained obstetrician could do much to prevent damage to both mother and child, and also could diminish the amount of pain, and shorten the period of suffering. We must give these leaders credit for being sincere and honest in their convictions. The difference between the old "meddlesome midwifery" and the "newer obstetrics" lies chiefly in the judgment exercised as to when help could be given the patient without causing damage. The difference depended on who did it and how good was the judgment that was exercised.

In 1920, De Lee[1] wrote his initial paper on "Prophylactic Forceps." This somewhat unfortunate name he applied to a group of procedures which not only included a forceps delivery when the fetal head appeared on the pelvic floor, but preceded this with the administration of some pain-relieving drug during the first stage of labor. Included with the actual delivery was the routine performing of an episiotomy and the early removal of the placenta. This technique was recommended only for the well-trained obstetrician, and it was emphasized that for the lesser trained watchful expectancy would still be the safer procedure.

This initial discussion of DeLee created a great furore in obstetric circles. The idea received both approval and criticism, and out of this proposal there has developed what may be termed the "newer obstetrics."

It is true that some earlier obstetricians had suggested more active procedures. But apparently the degree of obstetric training possessed by the rank and file of obstetricians at large was not of a high enough degree to give sympathetic approval. Only the well-trained could practice thus safely. These early suggestions were criticized and the idea usually disappeared with the individual. For example, the teachings of Osiander[2] (Göttingen, 1792-1822) "who applied forceps more frequently than any of his contemporaries, apparently sparing only such patients as were delivered spontaneously before he could operate," did not find many sympathizers or imitators, and we find very little mention of it in medical literature.

DeLee's proposal automatically classified all practicing physicians into two groups and it was argued that most obstetricians would place themselves in the classification of choice, and that much harm would result if improperly trained men practiced the newer ideas. Also it was suggested that skilled obstetricians had a responsibility in that their practices might be imitated by the lesser trained and thus much harm could result. However, the leaders in this movement held that obstetric standards should not be based on what the lesser trained could do, but that skilled men should give their patients the benefit of their skill and should not be held responsible for what the less skilled imitators would do.

In what department of medicine is it not true that there is a great difference in results depending on whether a certain procedure is performed by an expert or by one less trained? And the more major the procedure, the greater difference there will be! And what field of medicine and surgery would have made progress if all operations were limited to those only that a lesser trained individual could perform? Where then would there be a place for ingenuity and skill in the practice of obstetrics? If certain physicians develop a high degree of skill and can be of aid to suffering patients, without endangering the life and health of mother and child, must they refrain from exercising this skill and offering this aid simply because some lesser trained practitioner may attempt to imitate them? When this criticism is made, is it not viewing the problem from the wrong angle? Apply that same criticism to any field of medicine and what is the answer? Should not the responsibility be with the lesser trained, should he not recognize his limitations and practice within these limits? And if he wishes to practice on a different plane, should he not qualify himself by the necessary period of training? Development of a conscience and recognition of one's limitations are requisites for safe practice in any field of medicine.

Following DeLee's presentation of this proposal, the discussion brought out a great variety of opinions as to the wisdom of the suggestions. Williams[3] was very critical and frankly skeptical of the ideas expressed and felt that if the practice became general much harm would result. The proposed manage-

ment of the third stage of labor he considered "perniciously active." Thomas Watts Eden[4] was likewise critical and was puzzled as to what the proposal was supposed to prevent.

The chief stumbling block to general acceptance of the more active practice of obstetrics seemed to be about DeLee's advocacy of dividing the practitioners into two groups, and his recommendation that the procedure be practiced only by those properly trained and with proper professional judgment.

Notwithstanding criticism by some practitioners, many advocates of the "newer obstetrics" appeared. The practice was considered to represent the application of surgery to obstetrics. It was argued that if a physician acquired a high type of special training, and then if he could not use this greater ability to aid his patients, why then should he spend all the additional time in training?

While the arguments continued, the practice of the "newer obstetrics" has taken a foothold both in this country and elsewhere,[5] and it may be considered timely to review these practices and proposals, and try to estimate and evaluate the effects produced on the patients, and on the practice and teaching of obstetrics.

In choosing the subject, "An Evaluation of the Newer Obstetrics," I am aware of the fact that others have spoken on the same subject. Bill[6] in 1934 in his presidential address before a national society spoke on the "newer obstetrics." Likewise, Williams,[3] Davis,[7] Miller,[8] Eastman,[9] Skeel,[10] Kestenen,[5] Cosgrove,[11] Polak,[12] and many others have written on this problem. So it is not my pretense that I am presenting a new subject. In discussing the problem I am presenting it as one trained and taught in a conservative school of practice, but also one who has accepted a great many of the ideas of the "newer obstetrics," but nevertheless also one who still has a profound respect for the older conservative teachings.

The practice of routinely delivering patients by the prophylactic forceps operation as suggested by DeLee has found many advocates. In a great many hospitals the incidence of forceps delivery has greatly increased. In earlier days when a normal incidence of application of forceps had been 7 to 9 per cent, many of us were alarmed and stood aghast at the gradual increase of its incidence. Well do we recall how we felt compelled to admonish the staff that 18 per cent incidence of forceps delivery was too high. That was the incidence at Harper Hospital in Detroit in 1922. In 1948 this incidence was 60 per cent and in some previous years still higher. We believe this is a fair sample of what has occurred in most hospitals. In fact, in some clinics this type of delivery has become routine. While all this increased operative delivery was taking place, it is a fact that in the last twenty-five years there has been a gradual drop in maternal mortality and morbidity and also in fetal mortality. While some enthusiasts may argue that this improvement in mortality and morbidity is entirely the result of the newer obstetrics, I would rather suggest the viewpoint that the newer active obstetrics cannot be given the credit alone.

There have been so many developments in the practice of obstetrics that make for improvement in end results that it hardly seems reasonable to ascribe

enthusiastically all better results to one factor. Better prenatal care has become the rule, and patients are in better condition for labor and delivery. Better hospital care has been established and more patients are receiving this hospital care; new drugs for preventing and combating infections have been found; establishment of blood banks and blood transfusion services has been a great factor; a better knowledge of the toxemias of pregnancy has contributed to the improvement. Of all these factors, only one can directly be related to the more active obstetrics, namely that in toxemias of pregnancy we have learned better methods for inductions of labor than the old bougie or bag method. We believe we can conclude that the more active obstetrics did not retard or hinder the lowering of mortalities and morbidities. We believe the advantages to be derived from this active practice consist more in the fact that the wear and fatigue of labor has been lessened, that the period of suffering has been decreased and shortened, that the fear of labor is diminishing, and that the damage and injury that can accompany normal labor have been reduced. From the fetal standpoint we believe we may postulate that since a prolonged second stage can cause fetal damage, part of the improvement in fetal mortality and morbidity may definitely be credited to the newer active obstetrics. In Michigan the maternal mortality has diminished from 9 per one thousand live births in 1920 to 1.1 in 1947. The infant mortality rate in Michigan has dropped during the same period from 90 to 30 per one thousand births. In analysis of the fetal deaths, here again all improvements cannot be credited to the newer obstetrics since in all fairness we must give the pediatricians due credit for their share of accomplishments.

After observing the practice of this newer obstetrics in a fairly large private clinic one cannot help but feel that in spite of the skill of the men who do the work, the practice still calls for a great deal of judgment. The teaching that the baby can be delivered as soon as the cervix is completely dilated does not mean that all such deliveries are equally safe. In most cases the safety depends on the degree of descent of the presenting part, and, therefore, if the normal processes of labor can bring the presenting part down to the pelvic floor, it would seem safer then to complete the delivery by the prophylactic forceps procedure. However, if the presenting part is well up when the cervix reaches full dilatation, it would seem still wiser to delay instrumental delivery until the presenting part is on or near the pelvic floor. We feel nearly all the safety that exists in this active practice is confined to the cases where the presenting part has reached the pelvic floor. After one experiences the ease with which such patients can be delivered there is the danger that this very easy procedure may be abused when the attendant attempts delivery with the presenting part still high up in the pelvis. Experience will show that in such cases extreme judgment is still very necessary.

We must bear in mind that the proposed prophylactic operation did not mean merely a forceps delivery, but part of the advocated procedure was the routine performance of an episiotomy. The value of episiotomy seems well established. Not only is this procedure theoretically a safeguard against cere-

bral injury in the baby, but there remains no doubt that the mother is left in better state after episiotomy than after delivery without episiotomy and even supposedly without laceration. We can well recall in our earlier days of practice our surprise at the postpartum checkup six weeks after delivery to find sometimes a markedly relaxed vagina in a patient who had delivered spontaneously, supposedly without a laceration. We would now prefer a frank incision rather than have lacerated muscles of the pelvic floor hidden by an intact mucosa. The ragged and contused edges and surfaces of a laceration are not only difficult to repair, but healing is often imperfect. A clean-cut incision can be sutured with great ease as compared to an irregular laceration. This is, however, a definite surgical procedure and must be accompanied by the aseptic safeguards of an elective surgical operation, and its repair must be under similar aseptic surgical conditions. Haphazard repair of lacerations as formerly undertaken will not give good results. And the physician who performs an episiotomy must have in mind a definite technique of surgical repair, and should also have facilities for an aseptic operation. Also, it calls for more complete anesthesia than is often used for repair of lacerations. In other words, the performing of an episiotomy, with its repair, is definitely a surgical procedure to be performed by one surgically trained, and the operation should have the benefit of proper anesthesia and aseptic operating-room technique. It is a question whether such a procedure can be safely performed outside of a hospital.

The performance of an episiotomy does definitely shorten the second stage of labor and since it lessens and shortens the pressure on the baby's head during the second stage one can reasonably infer that it is a safeguard against cerebral damage in the fetus.

When one sees the excellent pelvic floor support a patient has after even several episiotomies one cannot help but believe that this procedure would decidedly lessen the occurrence of cystocele and rectocele as well as prolapse. In nearly all gynecologic clinics the cases of marked prolapse and cystocele are becoming so rare that there is hardly ample material to train and instruct the residents properly.

In discussing more active attempts at delivery, we should also consider the newer proposals regarding breech delivery, although this was not in the original proposal which launched the newer obstetrics on its career. The management of breech deliveries has always been conservative until the last few decades, when more active proposals have been made. The conservative method of breech delivery has been to allow physiologic progress to continue until crowning occurred. Here is where episiotomy is very rational in that it allows safer and easier delivery of the after-coming head. Since breech delivery has always been attended with an extra fetal risk, proposals have been made in hope of reducing this risk. Goethals[13] and others have advised the employment of earlier breech extraction in the effort to reduce fetal mortality. Goethals[14, 15] has written extensively on this subject and reports a fetal mortality of 6.2 per cent for primiparas and 5.3 per cent for multiparas in cases where no factor can be considered causing fetal death other than the breech presentation. Believing that

the extra fetal mortality has been due chiefly to prolapsed cord and difficulty in delivering the fetal head, we at Harper Hospital have felt the fetus was safer at birth when the expelling force came from above, rather than from traction from below. By watching labor progress and assuring ourselves the fetal heartbeat was satisfactory, it was felt the fetus would be in less danger if nothing were done to cause extension of the fetal head. On this basis we have felt that conservative physiologic treatment was more rational than traction from below. Where added force was needed, the Kristeller maneuver of fundus pressure has been used to aid the breech to crown. Then, with the performing of an episiotomy, the fetus can be born spontaneously as far as the umbilical cord. After that active traction plus fundus pressure usually accomplishes an easy delivery of the fetus. This is the method of choice at Harper Hospital, and the statistics collected and recorded by Seeley[16, 17] show a mortality of 4.8 per cent, which is definitely better than the results recorded by active delivery as soon as the cervix is dilated. For this reason we cannot follow the proposal of more active delivery in breech presentations. The idea of routine episiotomy in these cases is borrowed from DeLee's proposal of routine episiotomy with prophylactic forceps delivery. In this way only has the idea of the newer obstetrics influenced our management of breech delivery.

Pain relief during the first stage of labor was a definite part of DeLee's prophylactic forceps procedure. Originally a modification of the old-time twilight sleep was used, the drugs used being morphine and scopolamine. Experience with this type of twilight sleep had shown that a prolonged second stage was particularly unfortunate for the baby. This no doubt was a factor in the proposal of prophylactic forceps delivery. The general aim was to prevent wear and exhaustion of the patient's nervous system and to relieve her from fear of labor.

The use of some type of pain relief during the first stage of labor has now become so well established that there is little new to be said about it. There is no doubt that earlier in this practice the methods were abused, and that the dosage of drugs used was too large. This led Schreiber[19, 20, 21] to believe that the analgesic drugs caused a fetal cerebral anoxia, with subsequent necrosis and in some cases permanent cerebral damage. By use of smaller dosage and over a shorter period of time, and the avoidance of a general anesthetic before the birth of the baby in addition to the analgesia, it seems that the practice is now on safer grounds. Only the enthusiast will claim these drugs are completely harmless. They must still be used with great caution. But when properly used there can be no doubt the practice is a great boon to women in labor.

The drugs recommended for pain relief are almost numberless. This in itself is a testimony that the perfect drug has not yet been found, and that the last word on this subject has not been written. We must also remember that the giving of analgesic drugs may cause unexpected problems. With the decreased throat reflexes aspiration of vomitus is a greater hazard. Fetal anoxia

is a never to be forgotten occurrence and a proper oxygen administration outfit is essential for the safety of the baby. As mentioned before, a general anesthetic superimposed on a deep analgesia may make fetal resuscitation a problem. On the other hand, in a very restless or excited patient the giving of a spinal anesthetic may be difficult and hazardous, or the use of a local perineal anesthetic may be impossible. The avoidance of these imposed complications may be a difficult problem. We believe the advantage of the local anesthetic has not been sufficiently recognized.

There seemingly is an antagonistic reaction to pain relief in the minds of some obstetricians. The ideas of Grantly Dick Read[22] concerning the results of fear, and its relation to suffering during labor, have obtained support among some obstetric leaders.

It is felt by these men that a great deal can be done toward the preparation of the expectant mother for the process of labor. By relief of fear, instruction in relaxation and proper use of muscles, and by proper encouragement and moral support during labor, much can be done and the use of drugs can be reduced to a minimum. The Yale University Clinic under the direction of Thoms[23] has been especially interested in reviving the idea that normal labor can be an experience not too fearful, uncomfortable, or formidable.

But we venture to predict that it will be a long time before most women in labor will be willing and ready to go through labor without some type of pain relief. The obstetrician who preaches and promises the greatest pain relief will doubtless have the largest practice for a long time to come. But, in the past, pendulums have swung and may do so again. It is still important that obstetricians should evaluate their results, and educate their patients to the fact that all types of pain relief may carry a definite hazard.

Although the newer obstetrics began by proposing more active methods of delivery, the field has now been broadened, and beside the use of the prophylactic forceps procedure it now presents such problems and procedure as (1) induction of labor, (2) widened indications for cesarean section, (3) use of Pituitrin in labor, (4) early ambulation post partum, and (5) management of premature delivery.

Induction of labor at term has also been a development in obstetrics during the past few decades. Prior to that time labor was induced only for medical reasons, indicated by conditions that made the continuation of pregnancy hazardous for either mother or child, or both. The work of Reed,[24] Plass,[25] and others has shown that induction of labor at term can be safely performed if proper precautions are observed. It is important that full-term pregnancy be diagnosed and verified by examination. Also, complications must be ruled out. The examination should give a correct diagnosis of fetal position and presentation, as it has been shown that the procedure may be attended by added fetal risk in cases of breech presentation. What can be said chiefly about the procedure is that with proper precaution it can be done safely. And in cases of toxemia of pregnancy we need not be as hesitant as we were formerly to induce labor. But the advisability of inducing all labors at term has not been estab-

lished, nor the idea accepted. The procedure has proven safe enough, however, so that perhaps indications for induction can be widened. The induction of labor for the convenience of the obstetrician or patient is still a debatable question. Incidentally, the experiment has taught us that the older concept as to the function of the amniotic sac was rather erroneous.[9] Furthermore, we may add that, when inducing labor without a medical indication, the obstetrician takes on an extra burden and responsibility that he need not take, and whatever complication may develop during or after labor is likely to be attributed to the induction procedure. The attempt to induce labor, with the onset of labor long delayed, may be a worrisome experience for the obstetrician. In such cases the long delay, if the membranes have been ruptured, may require antibiotic medication.

The widening of indications for cesarean section has no doubt been influenced by the fact that cesarean section, like many other surgical procedures, has had a gradual lowering of mortality. Cesarean section should always have a lesser mortality than is associated with the situation it aims to correct or relieve. Cesarean section should be performed only for definite preoperatively diagnosed indications. The percentage of necessary cesarean sections is hard to determine. The actual incidence of performed sections varies in different hospitals from 10 per cent down to 0.5 per cent. It is not easy to reconcile these variations. Too many sections are performed because of fear—the attendant being afraid not to operate, and yet not knowing exactly why he operates. The better trained and the more experienced the obstetrician, the fewer will be the cesarean sections on that basis. Also, many are performed for doubtful indications. Perhaps often cesarean sections are not performed where the indications really exist. It is important that the indication be well established and evaluated before operation. All diagnostic aids should be utilized. Many cases of suspected disproportion can be saved from operation by x-ray pelvimetry. Likewise, cases of bleeding late in pregnancy should have the benefit of roentgen study. The fact that the presenting part is high, or that some unusual bleeding has occurred does not necessarily demand cesarean section. A seasoned experience here is the safest guide. Certain rare cases of fulminating pre-eclamptic toxemia, or severe cases of hypertensive toxemia near term, when the condition of the cervix suggests the possibility of difficult induction of labor, may benefit by cesarean section.

The rare cardiac patient who presents frequent episodes of decompensation during pregnancy may benefit by cesarean section. It can be performed during a period of compensation when with a slow method of induction labor might not begin until the next period of decompensation was reached. These cases are rare and we believe very few patients with cardiac disease require cesarean section.

Neoplasms require cesarean section only when they obstruct the birth canal. We do not believe a cesarean section is indicated just to make removal of the tumor possible. Also, we decry the performance of cesarean section just to furnish an opportunity for sterilization.

Fetal indications for cesarean section are rare, and we must remember that cesarean section carries with it an unexplained higher fetal mortality than normal delivery. We agree with Mengert[26] that cesarean section is rarely a hurried emergency operation to be performed after an unexpected sudden decision. All in all, cesarean section is a valuable procedure, and can save many lives but one must constantly check his indications and be confident of his reasoning, and thus insure that the valuable procedure is not abused.

The fact that in many clinics the first cesarean section is considered an indication for the succeeding one makes it imperative that definite indications are established for the first section. The first section, therefore, requires a great deal of judgment and places a great responsibility on the attendant, since his decision may influence the entire obstetric future of that patient.

As pointed out by Mack and Siddall[27] in their recent contribution to the program of our association that although cesarean section is useful and lifesaving in some instances, it is still not the safest method of delivery.

The use of Pituitrin in labor has undergone a radical change in recent years. The older teaching proclaimed Pituitrin safe only after the uterus was empty, and some obstetricians decried its use even then. It has been believed by Siddall,[28] Eastman,[9] and others that the use of Pituitrin in small (one minim) doses was of benefit in the first stage of labor in some cases of uterine inertia. The small dose of Pituitrin will often result in spontaneous delivery, and often it may convert what would promise to be a difficult forceps delivery into a comparatively easy one. The importance of the smallness of the dose is emphasized. This is also a departure from the older belief and practice, and the idea finds support from many leaders in obstetrics. Rather than teach the student or intern that Pituitrin should not be used, he should be taught how to use it. We believe this idea has great value, and, when practiced cautiously, with conscientious judgment, as advised, is a safe and useful practice.

From the surgical clinics obstetrics has borrowed the idea of early ambulation.[29, 30] It is difficult to evaluate the results of this idea since many of the bad effects following obstetric practice appear later in life. The practice of early ambulation does seem to make for more rapid recovery, the chief factor seeming to be the fact that patients do not lose their strength when allowed to ambulate early. Also, more normal physiologic function of bowels and bladder occurs. It will take a prolonged observation to determine whether phlebitis and embolism are lessened by this practice. We must pass this on to a future generation for evaluation.

In evaluating all these changing methods and ideas of practice, we are confronted by the gradual decrease in maternal and fetal mortality. It would seem that this changing thought and practice in obstetrics have at least not resulted in greater mortalities, but on the contrary the decrease in mortalities has continued constantly. It would at least seem as if the newer obstetrics has not done any harm. To state that the lower maternal mortalities are due to the active newer obstetrics would also be difficult to prove. As previously stated, the important positive good results of the newer obstetrics are observed in other directions.

Reviewing the problem as a whole, we believe it fair to state that it is the high standard of obstetric training that has made this more active practice of obstetrics, without increased mortality or morbidity, possible. Results have seemed good because well-trained men have practiced it. It will always mean that a high degree of training will be essential to the safe practice of the newer obstetrics. Not only is high technical skill essential, but a well-trained judgment and an honest conscience are indispensable qualities for the safe practice of the more active obstetrics. With these qualifications our womanhood will be safe in accepting the relief that the well-trained obstetrician can offer her.

What effect on our medical students and interns will the practice of the newer obstetrics have? Fundamentally students should have a basic understanding of what the normal process of labor is. Undergraduate students should certainly have the opportunity of observing normal physiologic labor. They should be able to see that a baby can normally be born without forceps, or even without episiotomy, and even without pain relief. No student will ever be able intelligently to imitate the normal mechanism of labor in operative deliveries if he does not have a good basic understanding of what the normal mechanism of labor is. Just at what stage the young graduate's attention should be called to the newer obstetrics is difficult to judge. During his medical-school career his training should preferably be most conservative. This will be necessary in order that he may acquire the necessary understanding of the fundamentals of labor and mechanism of labor. After he has graduated he will doubtless be exposed to the newer obstetrics perhaps altogether too early. And to him it may all be very puzzling. This is a phase on which obstetric teachers can well give us advice. We do believe their fundamental teaching should be conservative and really all the student needs to know at the time is that normal mechanism can be imitated by the well-trained obstetrician, and he should be admonished that this should be attempted only by the properly trained or well-seasoned obstetrician. And we can again emphasize that special training is essential for those who practice the newer obstetrics. Fortunately, resident training is becoming more and more available and the hope may be expressed that soon enough well-trained men may be available to take care of the major obstetric practice in this country.

If, together with the essential careful judgment and clinical training, we can instill in our recent graduates a sense of conscientiousness, then we will be well on the way to serve womankind in a safe and secure way. Let me again emphasize that if the newer obstetrics is to be a boon to womankind, its fundamental requirements will always be the meticulous training and conscientious judgment of the obstetrician.

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1807 David Whitney Building

EXPERIMENTAL STUDIES ON PROTEOLYTIC ENZYMES IN THE ENDOMETRIUM OF PREGNANCY, TO EXPLAIN CERTAIN CLINICAL PHENOMENA IN ENDOMETRIOSIS*

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IT HAS been repeatedly observed that ectopic endometrial tissue removed during pregnancy shows a very pronounced decidual reaction (Fig. 1). It has also been observed by Gainey,[2] O'Connor,[3] and others that many patients with severe pelvic endometriosis show marked improvement under the influence of pregnancy. It has been further observed that, when these patients, whose symptoms and findings show such improvement, are subjected to cesarean section, instead of there being massive fibrous adhesions, only patches of grayish tissue are found upon the peritoneal surfaces. When these patches of grayish tissue (Fig. 2) are subjected to microscopic study, they are found to consist of almost pure decidual-reacting tissue.

In view of these facts, it was believed that the clinical improvement seen could be explained most satisfactorily by the hypothesis that the adhesions were destroyed by the elaboration of proteolytic enzymes by the decidual-reacting tissue. Accordingly, it was felt that for experimental purposes an animal with a bicornate uterus should be chosen and also that the animal should be large enough so that appreciably large amounts of tissue specimens could be removed for microscopic studies and biochemical assays. For the above reasons the studies were carried out on a series of fourteen sexually mature female dogs weighing approximately twenty pounds.

Material

In the first step of the experiment, the animals were anesthetized with intravenous Pentothal Sodium and the left horn of the uterus was isolated from the cervix and the cervical stump closed. At the same time a specimen of the isolated horn was removed and fixed for microscopic study and another portion was removed and frozen for biochemical assay. Also twenty c.c. of blood were obtained, citrated, and frozen for biochemical assay to determine if there were present any proteolytic enzymes in the circulating blood.

As soon as the wounds were healed, estrus was induced by endocrine stimulatory methods and the dogs were bred. At the time of heat, two dogs died suddenly and three failed to react and did not breed. The nine remaining were carried through the rest of the experiment (Table I).

In the next step of the experiment, when each of the animals was from four to six weeks pregnant, the abdomen was reopened and the isolated uterine horn removed, and again a small piece was fixed for microscopic study and the remainder frozen for biochemical assay. Likewise, twenty c.c. of blood were obtained, citrated and frozen for biochemical assay for enzymes in the circulation.

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TABLE I

DOG	DATE OF FIRST OPERATION	DATE BRED	RESULT OF BREEDING	DATE OF SECOND OPERATION	FIRST TISSUE SECTION	SECOND TISSUE SECTION
A	7/28/49	9/8/49	Pregnant	10/7/49	Nonsecretory endo.	Nondecidual secretory glands
B	7/28/49	9/9/49	No conception	10/7/49	Nonsecretory endo.	Nonsecretory endo.
C	7/28/49	8/25/49	No conception	10/7/49	Nonsecretory endo.	Nonsecretory endo.
D	7/28/49	Died	------	------	Nonsecretory endo.	----------
E	7/28/49	Did not breed	------	------	Nonsecretory endo.	----------
F	7/28/49	9/8/49	Pregnant	10/7/49	Nonsecretory endo.	Nondecidual secretory glands
G	7/29/49	9/8/49	Pregnant	10/7/49	Nonsecretory endo.	Nondecidual secretory glands
H	7/29/49	9/8/49	No conception	10/7/49	Nonsecretory endo.	Nonsecretory endo.
I	7/29/49	Did not breed	------	------	Nonsecretory endo.	----------
J	7/29/49	8/26/49	Pregnant	10/7/49	Nonsecretory endo.	Nondecidual secretory glands
K	7/29/49	9/8/49	Pregnant	10/7/49	Nonsecretory endo.	Nondecidual secretory glands
L	7/29/49	8/24/49	Pregnant	10/7/49	Nonsecretory endo.	Nondecidual secretory glands
M	7/29/49	Died	------	------	Nonsecretory endo.	----------
N	7/29/49	Did not breed	------	------	Nonsecretory endo.	----------

The microscopic studies showed a nondecidual endometrium (Fig. 3) in the nonpregnant animal and showed maturation of the endometrial glands and in some cases stromal edema, but no true decidual reaction (Fig. 4) in the sections from the pregnant animals.*

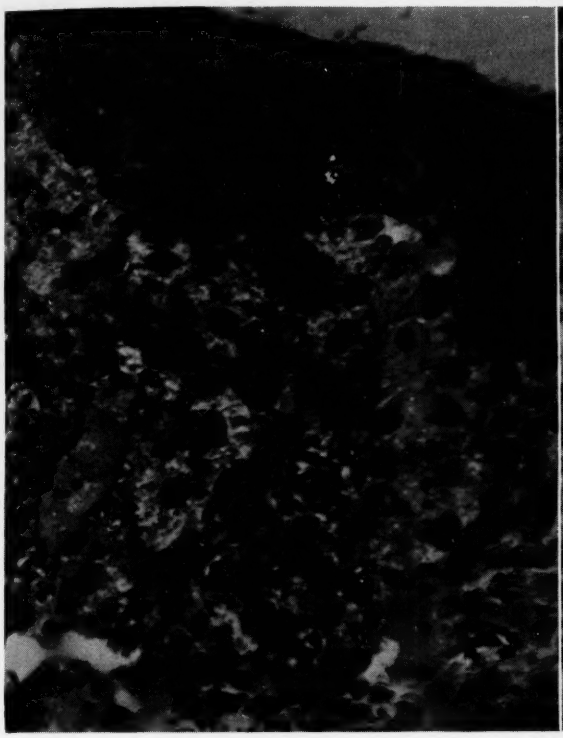

Fig. 1.

Fig. 2.

Fig. 1.—Decidual reacting endometrium in a discrete ovarian cyst removed from a patient at 17 week's gestation.

Fig. 2.—Decidual reacting endometrium removed from a peritoneal surface during cesarean section at term.

In the biochemical assays, the tissue samples were weighed and homogenized in a Waring blender, and made to a volume of twenty-five times the wet weight (4 per cent solution) with distilled water. Plasma samples were used undiluted. Samples of tissue homogenate and plasma were mixed with equal volumes of:

1. Two per cent casein in M/15 Sorensen phosphate buffer, pH 7.1.
2. Eight per cent (wet weight) homogenate of normal myometrium in M/15 Sorensen buffer, pH 7.1.
3. M/15 Sorensen buffer, pH 7.1.

The mixtures were covered with toluene and incubated for 48 hours at 37° C., when samples were withdrawn for titration for enzyme activity, and the remainder was allowed to continue to incubate for an additional 120 hours at 37° C. At the 48-hour and at the 168-hour titrations, 2- or 3-c.c. aliquots were withdrawn and amino-nitrogen was measured electrometrically by formal titration. The aliquot was diluted with distilled water to 25 c.c. and titrated to pH 8.8. Ten c.c. of 35 per cent neutral formaldehyde solution were added and the solution titrated again to pH 8.8 with 0.05 N sodium hydroxide.

*Biochemical determinations made in the Department of Biochemistry, University of Kansas, Lawrence, Kan.

TABLE II. FORMOL TITRATION*

DOG	NONPREGNANT								PREGNANT							
	CASEIN SUBSTRATE				MYOMETRIUM SUBSTRATE				CASEIN SUBSTRATE				MYOMETRIUM SUBSTRATE			
	PLASMA ASSAY		ENDOMETRIAL ASSAY		PLASMA ASSAY		ENDOMETRIAL ASSAY		PLASMA ASSAY		ENDOMETRIAL ASSAY		PLASMA ASSAY		ENDOMETRIAL ASSAY	
	48 HOUR	168 HOUR	48 HOUR	168 HOUR	48 HOUR	168 HOUR	48 HOUR	168 HOUR	48 HOUR	168 HOUR	48 HOUR	168 HOUR	48 HOUR	168 HOUR	48 HOUR	168 HOUR
A	–†	+‡	–	+	–	–	–	–	–	+	–	+	–	–	–	–
B	–	+	–	+	–	–	–	–	NO CONCEPTION							
C	–	+	–	+	–	–	–	–	NO CONCEPTION							
D	–	+	–	+	–	–	–	–	DIED							
E	–	+	–	+	–	–	–	–	DID NOT BREED							
F	–	+	–	+	–	–	–	–	–	+	–	+	–	–	–	–
G	–	+	–	+	–	–	–	–	–	+	–	+	–	–	–	–
H	–	+	–	+	–	–	–	–	DID NOT BREED							
I	–	+	–	+	–	–	–	–	NO CONCEPTION							
J	–	+	–	+	–	–	–	–	–	+	–	+	–	–	–	–
K	–	+	–	+	–	–	–	–	–	+	–	+	–	–	–	–
L	–	+	–	+	–	–	–	–	–	+	–	+	–	–	–	–
M	–	+	–	+	–	–	–	–	DIED							
N	–	+	–	+	–	–	–	–	DID NOT BREED							

*No essential quantitative difference was observed between the pregnant and nonpregnant or the plasma and endometrial concentration of caseinolytic enzymes.

†No amino-nitrogen.

‡Increased amino-nitrogen present.

In the results of the titrations, the presence of amino-nitrogen would indicate that proteolytic enzyme activity had been present. In all titrations of casein solution (Table II) no evidence of enzymatic activity was present at 48 hours, but evidence of casein hydrolysis was present in all samples at 168 hours. There was no appreciable difference in the blood or tissue enzymatic activity between the pregnant and the nonpregnant animal samples. Therefore, it was concluded that dogs produce a casein-splitting enzyme in the blood stream or local uterine tissue that is unaffected by pregnancy. No other proteolytic enzyme activity was observed.

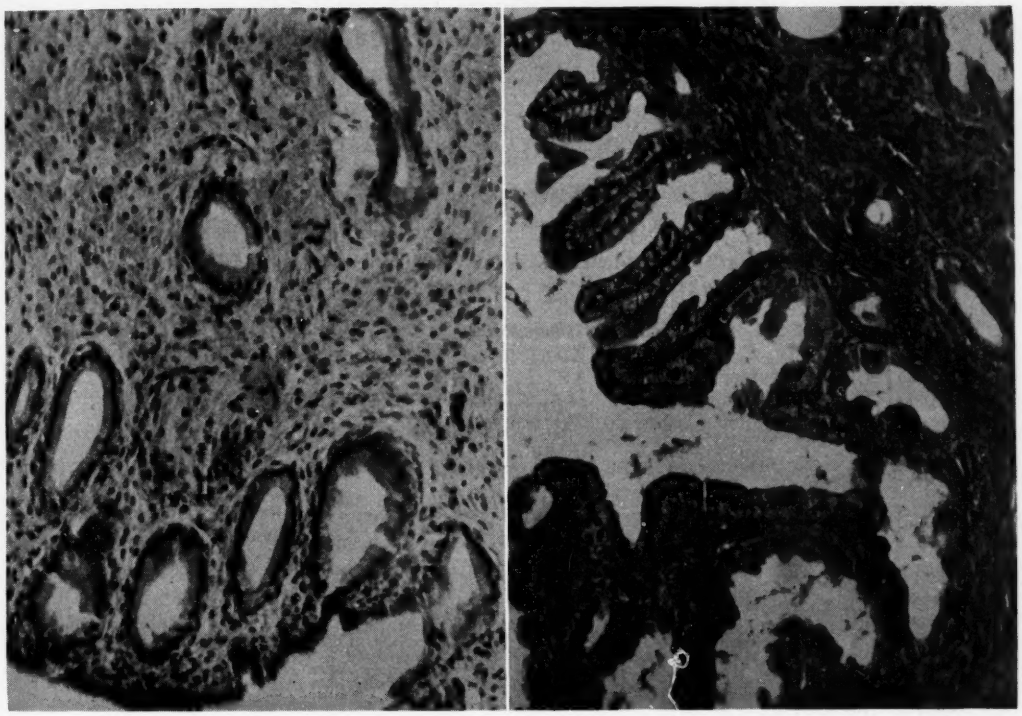

Fig. 3. Fig. 4.

Fig. 3.—Typical canine endometrium in a nonpregnant dog.

Fig. 4.—Endometrium from the isolated horn of a dog at 5 weeks' gestation, showing maturation of the endometrial glands, demonstrating the lack of typical decidual change as seen in human endometrium during pregnancy.

In 1946, Roemer[9] observed the regular appearance of a specific proteinase during the menstrual cycle. A proteolytic enzyme, specific for ovoproteins (follicle fluid) appears in the urine of healthy women at the time of the menstrual flow and for a few days in midcycle, at the time roughly approximating ovulation.

Odell,[4-8] Fishman,[1] and others have carried out extensive studies on glucuronidase production in normal and pregnant women and in patients with tumor growths. They have shown that its level is highest at midcycle when the ovoproteinase is also present, but that it is lowest at the time of menstruation when the ovoproteinase is also present, so their occurrence is not parallel. They also show that the pregnant cervix contains more glucuronidase than the normal cervix and that the cervix of malignancy contains the most glucuronidase of the three types studied.

This shows that the proteolytic enzymes do not follow the glycogenolytic enzymes in their elaboration. The failure of this study does not mean that decidual-reacting tissues do not elaborate proteolytic enzymes. It may be that our choice of animal was unfortunate and that we have encountered an unknown species difference. Also, the failure of this experiment may be due to technical faults.

Conclusions

1. Dogs elaborate a caseinolytic enzyme that is present in endometrial tissue and in the circulating blood, the production of which is unaffected by pregnancy.

2. The local reaction of the endometrial tissue to pregnancy in dogs varies widely from the typical decidual reaction in women.

3. This study still leaves open the possibility of such enzymes occurring in decidual-reacting endometrial tissue in women.

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Discussion

DR. LAWRENCE M. RANDALL, Rochester, Minn.—The authors conjectured that fibrinolytic or proteolytic enyzmes elaborated by decidual tissue might explain amelioration of symptoms produced by ectopic endometrium and altered appearance of this tissue during pregnancy.

Studies of growth, development, behavior, and function of the endometrium have attracted the interest of many investigators. We may assume a fairly secure premise when we consider the response of normal endometrium to normal amounts, sequences, and metabolisms of the normal hormonal stimuli.

When one postulates some variation from any of these norms such as alterations in environment, as is the case in endometriosis, variables are introduced which seriously complicate an evaluation of results. In other words, hormonal assays and cytologic studies are often difficult to evaluate; in our present state of knowledge, histochemical studies are more so.

My experience with histochemical methods is sharply limited to a small piece of work done with Barger relating to the presence of alkaline phosphatase in the endometrium during various phases of the menstrual cycle. In amounts and sequence of appearance this work corresponded with other evidence indicating that day 20 to 21 of a 28-day cycle is the period of highest function. This bit hardly qualifies me as an expert on enzymes, but perhaps I can qualify as an expert on the difficulties associated with this field of investigation in which effective work implies an exacting technique and organization of facilities and personnel.

The work under discussion has yielded negative results; so have many other enzymatic studies, probably because a very complicated and little-known field of genital physiology is being explored.

NONGONORRHEAL VULVOVAGINITIS DUE TO GRAM-NEGATIVE INTRACELLULAR DIPLOCOCCI*

JOHN DALE WEAVER, M.D., AUSTIN, TEXAS

(From the Department of Obstetrics and Gynecology of the University of Texas)

SEVENTY years ago Albert Neisser discovered the gonococcus. A paper on this subject today probably attracts less attention than it has at any time since its discovery. When a disease ceases to be a problem to treat or control it becomes of less scientific interest. Perhaps the next generation will find this a more interesting subject, because by then all of the peoples of the world will be sensitive to penicillin and all the organisms will be resistant to it, and it may again become popular and necessary at least to attempt a diagnosis before therapy is instituted. From Dr. Charles Lankford's work and teaching at the University of Texas we learned the value of bacteriological cultures in detection of the gonococcus, in contrast to the inadequacy of the stained smear in women. In known cases of gonorrhea in women, gram-negative diplococci were found in stained smears in less than 20 per cent of the cases, in comparison with routine cultures on proteose peptone hemoglobin agar which yielded a correct diagnosis in more than 75 per cent of the cases.

More than 40,000 cultures from the cervix and female urethra were studied in our department. When oxidase-positive gram-negative diplococci were found on these cultures, they were further studied by their fermentation reactions on various sugars, such as glucose, sucrose, maltose, levulose, and mannitol. The gonococcus will ferment glucose and none of the other sugars. The *Neisseria sicca* ferments all of the sugars except mannitol. It is this organism to which we wish to call attention because physicians who depend upon staining procedures for the diagnosis of gonorrhea may make false-positive diagnoses.

Early in the summer of 1945, it was proposed that all women inmates of State Eleemosynary Institutions be subjected to complete gynecological examinations. Most of these patients are indigents of the State. Few had had an evaluation of their pathological or nonpathological gynecological conditions. The project was interesting not only because of the health service we might render these patients, but also because the medical information that might be obtained would give an opportunity to compare the findings in this controlled group with the reports of uncontrolled groups. The fact that there are more than 12,000 women in Texas State Eleemosynary Institutions who are under control as to their activities and diet, as well as all their environmental conditions, suggests the scope of the statistical data which might be obtained. Here

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is a group of women who could be examined and kept closely under observation until their deaths, and in many instances they would remain in the same environmental state the remaining years of their lives.

It was an opportunity to evaluate routine biopsy of the cervix, as well as the value of a fresh smear for uterine cancer. It afforded an opportunity to do bacteriological research upon the female generative tract that could scarcely be equalled, since the patients could be under control, with *no* douches, no treatment, with diet regulated if desired, and with no coitus. Also, it would be an ideal opportunity to evaluate or screen new medicinal agents.

Funds were not available from Texas State Institutions to do such work.* The project was begun at the Austin State School during May, 1946. The cooperation of Supt. Dr. Charles Castner and the attendants at the school was beyond expectations; however, examination of the patients was almost beyond endurance. The patients are exceptional, in that they are low-grade morons, imbeciles, and idiots. More than 200 Mongolian idiots were examined. Many of these patients made every possible effort to prevent the examination by resistance.

The examination consisted of a complete gynecological study with abdominal inspection and palpation, and inspection of the perineum, vulva, and vagina with good light. In the beginning only abnormal lesions were biopsied, however, later, all cervices were biopsied and a fresh smear for cancer was done in all cases. Bimanual pelvic and in many cases rectal examinations were done. Vaginal wet smears for trichomonas were made in all cases. Every case was cultured from the cervix, urethra, or vaginal wall on proteose peptone hemoglobin agar for the Neisseria group; wort agar or Sabouraud's was used for cultures in every case to determine whether vaginal thrush were present. The pH of vaginal secretions was determined with nitrazine paper. All of the gynecological pathological conditions were evaluated and recorded at the time of the examination or while the examination was being done. All cases that needed operative procedures were listed, and many of them have been done.

A total of 1,014 women patients at the Austin State School were examined. A breakdown of pathological conditions is of interest, but will not be presented at this time.

Inflammatory changes in the genital tract were found in two hundred sixty-two, or 25.8 per cent, of the patients. Only four patients had gonorrhea. One of these patients had not been out of the institution for eleven months. She was believed to have had gonorrhea prior to admission. Stained smears after admission had not confirmed the previous diagnosis. This finding supports Cooke's belief "that the gonococci may harbor for very long periods of time to give rise to recurrences of acute vulvitis, etc."

Twelve of the patients had vulvovaginitis in which gram-negative intra- and extracellular diplococci were found that proved to be of the Neisseria group, and were identified after fermentation tests to be *Neisseria sicca*. The degree of inflammatory changes in these twelve cases was somewhat variable, but in all there were hyperemia and edema of the mucosa, with superficial desquamation, and the presence of a vaginal discharge. Some authors believe that *Neisseria sicca* is not a pathogenic organism; however, in the cases reported here the patients were youngsters. In children, according to Cooke, "the vaginal epithelium is of an undifferentiated, more or less round-celled type

*Financial assistance was rendered by Eli Lilly and Company, Indianapolis, Ind.

which offers little resistance to invasion." Therefore, we concluded, after ruling out the presence of other pathogenic organisms as well as glycosuria, that the vulvovaginitis found in these twelve patients was due to *Neisseria sicca.*

Stained smears as well as cultures were obtained from the vagina, cervix, urethra, and discharging material in each of these patients. The gram-negative intra- and extracellular diplococci were studied. After observing these stained smears Dr. C. G. Culbertson of the Indiana University School of Medicine stated that by smear stains alone one would identify these organisms as gonococci. He has long advocated the use of cultures.

He urged me to present our findings, stating that he knew of two epidemics of vulvovaginitis diagnosed as gonorrhea in which penicillin did not effect a cure. We have seen three cases in private practice of vulvovaginitis in little girls referred to us following repeated therapy with penicillin, sulfonamides, douches, etc. All of these three patients yielded on cultures *Neisseria sicca.* For a mother to be informed that her child has gonorrhea is indeed a shock, to say the least. Frequently there are outbreaks of epidemics of vulvovaginitis in orphanages and elementary schools. The organism producing the vulvovaginitis may prove to be the *Neisseria sicca,* and the disease may not be gonorrhea.

Summary

Vulvovaginitis due to gram-negative intra- and extracellular diplococci may not be gonorrhea. The children at the Austin State School, 1,014, received a complete gynecological examination. Inflammatory changes in the genital tract were found in 25.8 per cent. Twelve of these children had a vulvovaginitis from which gram-negative diplococci were found; the organism was *Neisseria sicca* and not the gonococcus. The gross findings in the tissues as well as the stained bacterial smears appeared the same as those of gonorrhea. Only by cultures and fermentation tests did we learn it was not gonorrhea.

Discussion

DR. JOHN W. HUFFMAN, Chicago, Ill.—We tend to place too much reliance on the Gram stain in studying genitourinary discharges. There is great variation in the Gram reaction not only with different strains of the same organism but with the same growth in different environments. Some organisms are Gram stable, others instable. Errors in technical procedure, changes in stains, and variations in the pH of the material examined all may adversely affect staining reaction. Furthermore, there are many diplococci which resemble the gonococci in staining characteristics and in morphology. The gonococcus itself may undergo modification as a result of changes in environment. It is, also, a delicate organism which is easily lost in culture and frequently missed in smears.

"Gram-negative intracellular diplococci" is a stereotyped laboratory phrase which has unfortunately been intimately associated clinically with but one member of the Neisserian group of organisms, the gonococcus. A clinical history, symptoms, and a smear which is stated to contain gonococci are frequently the criteria on which a diagnosis of gonorrhea is made. Such a diagnosis is a clinical one, the smear offering confirmatory evidence of the history of exposure and the clinical symptoms. In some instances it may not be necessary to identify the etiological factor further. In many cases, however, particularly those involving medicolegal or social problems, it is essential that the specific organism be identified. Culture methods for differentiating the various members of the Neisserian group are accurate, are not difficult to carry out in any good clinical laboratory, and are the only way in which legally or scientifically a positive diagnosis of gonorrhea can be made.

The Neisserian group of organisms contains three pathogens commonly found in clinical practice. These are the gonococcus *(N. gonorrhoeae),* the meningococcus *(N. intra-*

cellularis), and *Micrococcus catarrhalis (N. catarrhalis)*. It is not uncommon to find *Micrococcus catarrhalis* in genitourinary cultures. *Micrococcus pharyngis (Neisseria sicca)*, which Dr. Weaver reports as the causative agent in several cases of vulvovaginitis is usually considered a nonpathogen, as are the other Neisseria. It would have been interesting to know whether the organism, isolated by Dr. Weaver, when transmitted by inoculation to other patients, could have caused vulvovaginitis.

DR. HERMAN L. GARDNER, Houston, Texas.—It is good to know that someone is showing interest in at least one of a large group of vulvovaginal infections which, to date, have received little attention. For the past twenty years, a voluminous literature has accumulated pertaining to cervicitis, *Trichomonas vaginalis* and *Monilia albicans* vaginitis. During this same time, an extremely common and important cause of Leucorrhea has largely been overlooked, that is nonspecific bacterial vaginitis. This group of infections is as common as Trichomonas. The discharge is grossly similar to that of Trichomonas, but the foul odor of a Trichomonas discharge does not approach the offensiveness of that from a nonspecific bacterial vaginitis. The causative organism is most often an *E. coli* or staphylococcus. These organisms live a purely saprophytic existence in the vagina, utilizing mucus and vaginal debris, and this probably accounts for the obnoxious odor in this type vaginitis.

A smear of the discharge shows an almost solid layer of the offending germ and an absence of Döderlein bacilli. The epithelial cells and pus cells show partial destruction or digestion, as is indicated by their frayed edges, granulated cytoplasm, and partial obliteration of the nuclear and cellular outlines. Undoubtedly it is seen more frequently in those with subnormal nutrition, and in those who practice little vulvovaginal hygiene. The condition is most objectionable esthetically and physically and it is difficult to cure.

DR. WEAVER (Closing).—Dr. Huffman has asked if these organisms might be implanted into the vagina of other little girls. Yes, and I think it a very good suggestion. However, if such procedures were carried out, very careful observation should be made of the patients and they should be kept entirely under rigid control, because it is impossible to differentiate it clinically from gonorrhea. My efforts are merely a plea to encourage more and better bacteriology in these cases. Organisms that were once difficult to grow can now be grown very easily. The bacteriological work done in this research project has yielded more information than any other part of the project, and many patients have thereby been greatly benefited.

SOLID OVARIAN TUMORS COMPLICATING PREGNANCY*

A Clinical-Pathological Study

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(From the Department of Obstetrics and Gynecology of Louisiana State University School of Medicine and Charity Hospital of Louisiana)

THE recent occurrence of six cases of solid ovarian tumors complicating pregnancy at this hospital has led us to study this condition, and to compare the problem with that caused by other tumors concurrent with pregnancy. Experience in handling these cases substantiates the belief that the problems are more serious and the complications more frequent with solid ovarian tumors than with cysts or myomas. The combination is not common as a review of the literature indicates and its occurrence, even on large obstetric services such as the one at Charity Hospital, is only occasional. The fact that only thirty cases have been recorded in modern literature suggests that the records of many similar patients have not been published. Consequently, attention has not been focused on this rather serious combination of conditions which we believe is sufficiently grave to warrant careful consideration whenever abdominal tumors complicate pregnancy.

Another reason for presenting these cases is that one, the thecoma, has not been previously described in pregnancy and at least two others are exceedingly rare. Stout[24] reported a case in 1946 in which the final diagnosis was doubtful, but which he thought best fitted thecoma; his patient had masculinizing symptoms with the tumor.

The literature was reviewed for the past fifteen years only, since diagnosis of solid ovarian tumors was neither as standardized nor as accurate prior to that time as it is now. Even in going back this short an interval, we found unusual terminology and case reports in which the real nature of the tumor remains unknown. There were 30 instances where solid ovarian tumors complicated pregnancy.[1-28] The salient features are outlined in Table I.

It is important to note that additional pathologic complications were present in twenty-two cases. Whenever there were no complications, either the tumor was small or the gestation was early at the time of diagnosis and treatment. Table II lists these complications.

The treatment of all cases was uniform. All of the patients who had symptoms were operated upon. Most of those who were not at term were managed by local removal of the tumor or by salpingo-oophorectomy, allowing the pregnancy to continue. Only one patient aborted as a result of the operation, an incidence of abortion probably no higher than in pregnancy in general. Nearly

*Presented at the Seventeenth Annual Meeting of the Central Association of Obstetricians and Gynecologists, Oklahoma City, Okla., Nov. 3 to 5, 1949.

TABLE I

CASE AND AUTHOR	PRESENTING SYMPTOMS	TREATMENT OF TUMOR	OBSTETRIC OUTCOME	ADDITIONAL PATHOLOGIC CONDITIONS	RESULTS
1. Dysgerminoma LeGac[1] 1935	Abdominal distention	Local removal 7 days post partum	Spantaneous term delivery	Postpartal intestinal obstruction	
2. Dysgerminoma Stabler[2] 1937	Obstructed labor	Local removal	Section at term	Tumor previa	Well 33 months later 1 month later vaginal delivery
3. Dysgerminoma Dockerty[3] 1939	Mass in lower abdomen	Local removal at 2 months	Spontaneous term delivery	None	No recurrence at last examination (delivery)
4. Dysgerminoma Nyst[4] 1940	Dystocia	Local removal	Section	Tumor previa	Well after 2 years
5. Dysgerminoma Lorber[5] 1940	Abdominal pain and swelling	Local removal at 3 months	Spontaneous term delivery	None	Well after 5 years
6. Dysgerminoma Abernethy[6] 1943	Obstructed labor	Salpingo-oophorectomy 4 months post partum	Section at term	Tumor previa	Died 14 months later
7. Dysgerminoma Cunningham[7] 1942	Vomiting, onset of labor	Local removal deep x-ray	Section at term	Tumor previa	Stillborn child. Patient well 5 years later
8. Dysgerminoma Schneider[8] 1947	Abdominal pain	Salpingo-oophorectomy	Section near term	Tumor previa	Well 9 months later
9. Dysgerminoma Schomaker[9] 1947	Abdominal swelling	Salpingo-oophorectomy	Spontaneous term delivery	None	Well 2 years later
10. Krukenberg Wendt[10] 1935	Abdominal pain and mass	Laparotomy at 3 months	Spontaneous abortion 14 days postoperatively	Adenocarcinoma of rectum	Mother died 14 days postoperatively
11. Krukenberg Hagstrom[11] 1938	Vomiting, weight loss	None	Attempted surgical induction at 5 months	Carcinoma of stomach, multiple metastases	Patient died two days after admission
12. Krukenberg Watrin[12] 1939	Pain in abdomen, emaciation	Subtotal hysterectomy at 4 months	Interrupted	Gastrointestinal carcinoma	Patient died in 36 hours
13. Krukenberg Horta Barbosa[13] 1940	Edema of legs	None	Spontaneous abortion at 5 months	Carcinoma of stomach	Mother died after 7 days
14. *Brenner tumor Novak*[14] 1940	Lower abdominal pain	Removal of tumor at 4 months	Not stated	None	
15. Brenner tumor Novak[14]	Vaginal bleeding	Bilateral salpingo-oophorectomy, subtotal hysterectomy	Interrupted	Dermoid of other ovary	

*Reports additional case, not his own, in which Brenner tumor complicates ectopic pregnancy, not proved pathologically.

*Reports additional case, not his own, in which Brenner tumor complicates ectopic pregnancy, not proved pathologically.

16. Brenner tumor Siegel[15] 1940	Symptoms of toxemia	Local removal	Section at term	Tumor previa	Mother and baby well
17. Brenner tumor Rogers[16] 1943	Vaginal spotting abdominal mass	Local removal at 12 weeks	Gestation continued normally	Cystic degeneration of tumor	
18. Arrhenoblastoma Felicissimo Paula Xavier[17] 1938	Abdominal pain and swelling	Local removal at 2½ months	Term delivery by craniotomy	Torsion of tumor	Patient died shortly after delivery
19. Arrhenoblastoma Brentnall[18] 1945	Pregnancy, masculinization	Local removal	Section at term	Tumor previa	
20. Fibroma Pugliatti[19] 1937	None	Local removal	Section at term	Tumor previa, torsion of tumor	Mother and baby well
21. Fibroma Leon[20] 1943	Vomiting, abdominal pain	Salpingo-oophorectomy at 3 months	Low forceps delivery at term	Torsion	Mother and baby well
22. Leiomyoma Moore[21] 1945	Abdominal pain and swelling	Local removal at 2 months	Spontaneous term delivery	None	
23. "Lymphosarcoma" Trillat[22] 1934	None	Local removal	Section at term	Tumor previa	Live baby, mother died of metastases in 14 months
24. Solid adenocarcinoma Bossert[23] 1942	Acute abdominal pain	Bilateral salpingo-oophorectomy, subtotal hysterectomy	Interrupted	Left ovarian cyst-adenocarcinoma with rupture	Mother well at 3 months
25. "Theca-cell tumor" Stout[24] 1946	Premature labor	Local removal post partum	Spontaneous premature stillbirth at 7 months	Stillbirth	Masculinization receded
26. Granulosa-cell tumor Slamova[25] 1938	Cachexia, pain, amenorrhea	Salpingo-oophorectomy at 5 months	Spontaneous term delivery	Torsion of tumor	
27. Granulosa-cell tumor Henderson[26] 1942	Microscopic tumor	Found incidently at time of therapeutic abortion			
28. Granulosa-cell tumor Spencer[27] 1947	Recurring pain, vomiting	Local removal at 8 months	Spontaneous premature delivery	None	Mother and baby well
29. Fusocellular sarcoma Schockaert[28] 1936	Anemia, ascites, cachexia	Salpingo-oophorectomy at 5 months	Spontaneous term delivery	None	Mother died in 1 month from metastases
30. Globocellular sarcoma Schockaert[28] 1936	Abdominal pain	Local removal 1 day post partum	Spontaneous term delivery	Rupture of tumor	Mother and baby well after 10 months

all of the cases diagnosed late in gestation were managed by cesarean section and removal of the tumor at the same time. The obstetric outcome is indicated in Table III.

TABLE II. COMPLICATING CONDITIONS FOUND IN THIRTY CASES FROM THE LITERATURE

Tumor previa	9
Torsion of pedicle	5
Degeneration or rupture	4
Multiple metastases	4

TABLE III. OBSTETRIC OUTCOME FROM THE LITERATURE

Spontaneous delivery at or near term	11
Cesarean section	9
Interrupted by operation	4
Spontaneous abortion	2
Craniotomy at term	1
Died undelivered	1
Not stated	2

Material

During the past ten years there have been approximately 60,000 deliveries at the Charity Hospital of New Orleans. During the same time six patients were each found to have a solid ovarian tumor complicating the pregnancy. Five of these appeared during the past year and one-half, and the significance of their complications has left its impact. Accurate histologic diagnosis of these tumors required careful study of many sections. Multiple blocks were cut on the special tumors and connective tissue and fat stains were done where indicated. At the time this study was undertaken there was sufficient tissue and prepared material for adequate diagnosis of all but one tumor. Sections on all cases except the first, in which there was no doubt of the nature of the tumor, were sent to several gynecological pathologists. The opinions were alike on all tumors except that of Case 2, and on this one there was considerable divergence.

The clinical histories and pathologic findings are summarized as follows:

CASE 1.—N. T., aged 35 years, para ii, was first seen Aug. 5, 1943, in the admitting room for chills, fever, and amenorrhea. She was admitted to hospital where a diagnosis was made of (1) early (10 weeks') pregnancy, (2) pyelitis of pregnancy, (3) solid pelvic tumor about 10 cm. in diameter, probably ovarian, nonsymptomatic. Under appropriate treatment the pyelitis subsided and the patient was discharged to the prenatal clinic. The remainder of her prenatal course was uneventful. She was readmitted to the hospital in labor on Feb. 23, 1944. Sterile vaginal examination showed the firm movable mass about 10 cm. in diameter in the cul-de-sac, but it could not be pushed out of the pelvis.

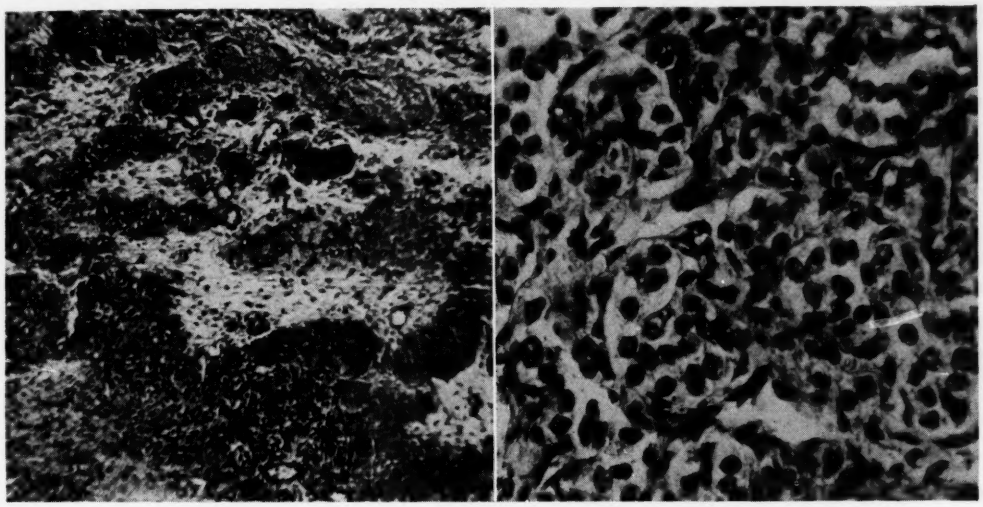
A cesarean section was done for tumor previa and anticipated obstructed labor. A normal 5 pound, 14 ounce girl was delivered. There were about 300 c.c. of straw-colored fluid in the peritoneal cavity. A firm, pedunculated, encapsulated tumor was seen in the pelvic excavation, occupying the site of the left ovary. It was removed. The patient had a postoperative course complicated by exacerbation of the pre-existing pyelitis, but recovered and was discharged on the eleventh day.

Pathological Examination.—The tumor measured 10 by 5 by 4 cm., and was white, avascular, firm, rubbery, and encapsulated. Cross section showed firm homogeneous substance with the consistency of a myoma and with small areas of degeneration toward the center. Histologically, all sections showed typical fibroma. Diagnosis: Fibroma.

The patient has remained well for a period of five years after surgery.

CASE 2.—E. L., aged 32 years, para vi, was first seen Dec. 3, 1947, in the gynecologic clinic complaining of lower abdominal pain and swelling for three months, both symptoms progressing. She gave a history of six term pregnancies, the last one in June, 1947. No note was made of pelvic tumor with this pregnancy or delivery. Menses were normal following the pregnancy and the last menstrual period was Oct. 21, 1947. Examination for the present complaint disclosed a large, circumscribed, semicystic, freely movable abdominal mass about 10 cm. in diameter apparently arising from the pelvis. The uterus was slightly enlarged. She was admitted to the hospital with the diagnosis of ovarian tumor.

At laparotomy on Dec. 12, 1947, there was found a right ovarian tumor, semicystic, gray, free of adhesions. The left ovary was bisected for evidence of tumor, but none was found. (No note was made of a corpus luteum or of the appearance of the uterus). A right salpingo-oophorectomy was done.



A. *B.*

Fig. 1.—*A*, Section of tumor of Case 2, showing groups of cells similar to interstitial testicular cells. (Low power, hematoxylin and eosin stain.)

B, Aggregations of clear cells resembling imperfect tubules, from same case. (High power, hematoxylin and eosin stain.)

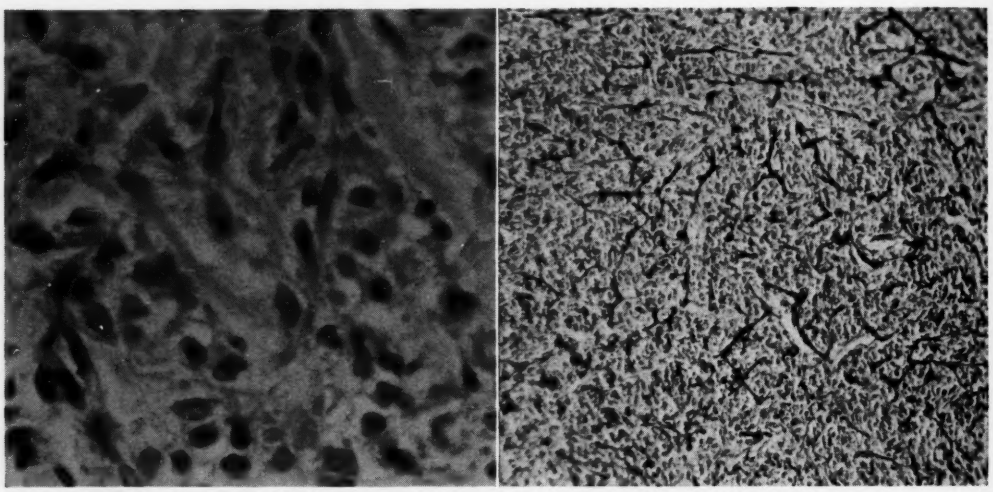
Pathological Examination.—The tumor was 12 cm. in diameter, smooth, encapsulated. The capsule was 0.5 cm. thick. The remainder of the mass was friable, reddish-brown tissue with areas of hemorrhage and necrosis. There were several small and moderate-sized cystic cavities containing clear fluid. Because of the extensive necrosis there was a limited amount of material available for histologic study. These are the sections upon which there was little unanimity of opinion among the pathologists consulted. However, we believe after careful study that it was an arrhenoblastoma. The major part of the viable tumor was composed of diffuse sheets of moderate-sized cells with deeply stained round or oval vesicular nuclei. These cells did not show a great deal of variation in size or shape. Mitoses were not seen. About the periphery of the tumor there were large vascular spaces, most of which were large clefts just underneath or just within the fibrous tissue capsule, lined by a single layer of endothelium; other smaller spaces had the architecture of blood vessels. There were groups of cells arranged about these vascular spaces and in along the periphery of the tumor which were similar in morphology to the interstitial cells of the testis (Fig. 1, *A*). They have the same characteristics as those ovarian hilar cells known as male-directed cell rests (Meyer[29]), sympathicotropic cells (Berger,[30] Brannan[31]), or hilus cells (Weiser,[32] Sternberg[33]). These cells have abundant granular

eosinophilic cytoplasm and moderate-sized vesicular nuclei, and appear mostly in clusters. One large cystic space was lined by columnar secretory type of epithelium. There were several areas in which large clear cells were arranged in clumps, a pattern which was interpreted as an abortive attempt at tubule formation (Fig. 1, *B*). (Compare with Case 5.)

Diagnosis.—Arrhenoblastoma.

Pregnancy was not yet diagnosed, but at the first postoperative clinic visit such a diagnosis was made. The gestation continued to the thirty-eighth week July 30, 1948, when a cesarean section was done for placenta previa. The female baby was normal. There was no evidence or recurrence of tumor.

Jan. 12, 1949, thirteen months postoperatively and six months postdelivery, the patient was seen and examined. There were no abnormal findings.



A. *B.*

Fig. 2.—*A*, Section of tumor of Case 3, showing plump, spindle-shaped cells with abundant intercellular material some of which forms hyalinized septa. (High power, hematoxylin and eosin stain.)

B, Mallory connective-tissue stain on the same tumor. The connective-tissue septa stand out, and the intercellular material shows up throughout the section. (Low power.)

CASE 3.—J. P., aged 18 years, primigravida, was first seen in the prenatal clinic on Jan. 13, 1948. Her last menstrual period was July, 1947. The only complaint was acne of the face. Pelvic examination by a competent examiner showed pregnancy of twenty-four weeks' gestation. No note was made of pelvic tumor. She was seen at two-week intervals, with the last visit on March 30, 1948. On April 10, 1948, the patient came to hospital complaining of dyspnea and cough. A chest x-ray was interpreted by a medical consultant as far-advanced pulmonary tuberculosis, and the patient was admitted to the isolation hospital. Within a few hours she was transferred to the obstetric service in active labor. Examination showed pulse of 120, respirations 50, blood pressure 142/88, no fetal heart tones, moderately hard labor, and no cervical dilatation. There was a large abdominal mass in the left upper quadrant, moderately soft, which was thought to be a very large spleen. Sedation was given and nasal oxygen was started. Several hours later a 7 pound, 9 ounce stillborn male infant was delivered by low forceps operation with episiotomy and repair under local anesthesia. Bleeding was average. Fifteen minutes following delivery the patient lapsed suddenly into profound shock. Abdominal palpation revealed a striking change in the consistency of the mass which now was firm. The customary emergency measures were undertaken; blood was obtained for transfusion, the uterine cavity was explored for rupture, and oxygen therapy under pressure was instituted. The patient died within a very few minutes.

Autopsy.—Intra-abdominal hemorrhage, 2,000 c.c. of blood; solid ovarian neoplasm, left, with rupture of capsule; pulmonary congestion and edema; hydrothorax, left; uterus, normal postpartal state. There was no evidence of pulmonary tuberculosis. Grossly the ovarian tumor was grayish-white, fleshy in consistency, encapsulated, smooth. It was attached by a pedicle, the left ovarian ligament, to the left adnexa. In its capsule there was a 6 cm. rupture. There was a large subcapsular hemorrhage. The cut surface of the tumor was of a homogeneous fleshy consistency. Sections from all parts of the tumor showed the same histologic structure. It was made up of uniform, rounded or slightly elongated, plump cells, with numerous intercellular fibrils which stained for collagen (Fig. 2, *A*). Thruoghout the entire section there were hyalinized septa which formed a framework for the enmeshed collections of the previously described cells. A few areas showed extravasation of fresh blood, while other areas showed old hemorrhage. Sudan IV stain revealed many small and large droplets of intracellular and extracellular lipid material. Connective tissue stain outlined the hyalinized septa and the moderately abundant collagen fibrils (Fig. 2, *B*). There were numerous large blood sinuses lying beneath the fibrous tissue capsule.

Diagnosis.—Thecoma.

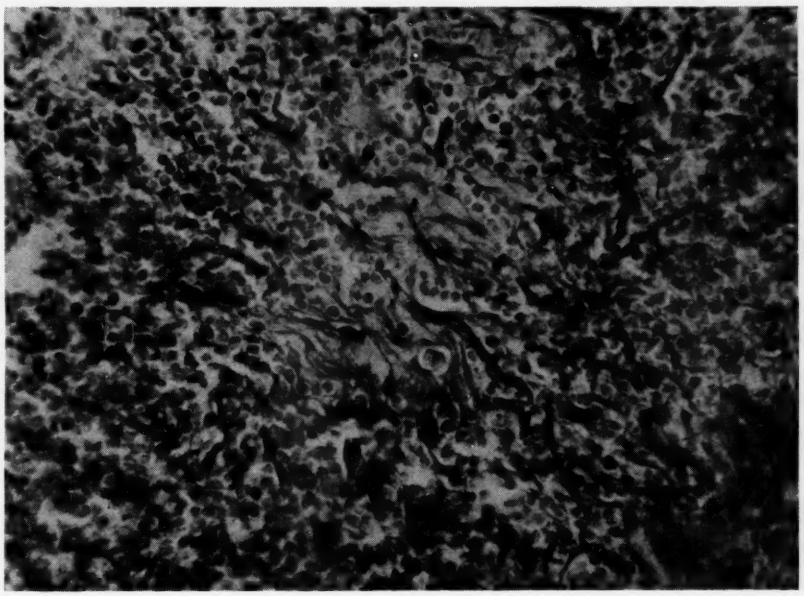


Fig. 3.—Section of tumor of Case 4. The connective tissue fibrils are visible and have been almost completely separated by hemorrhage. The structure of the tumor is obscured by massive infiltration with red blood cells. (High power, Mallory stain.)

Case 4.—F. N., aged 40 years, gravida vi, para iii, was seen on Aug. 15, 1948. This unregistered patient was admitted with a chief complaint of pain in the right lower quadrant of sudden onset this morning with nausea and vomiting. All pain and tenderness were located in right lower quadrant. Last menstrual period was Jan. 26, 1948, which made her pregnancy about six months in duration. There was a past history of hypertension with pregnancies and intrapartum eclampsia with the last. Also noted at time of last pregnancy two years ago was an 8 cm. pelvic mass. No further investigation was done then and spontaneous delivery occurred at term. Examination for the present complaint showed obesity and blood pressure 215/115. Palpation revealed tenderness in the right lower quadrant, irregular masses in the abdomen, at least two large and possibly several small ones. One large mass was thought to be the uterus, the other a pedunculated

myoma. Diagnosis was (1) pregnancy with myomas, possibly degenerating; premature labor, or (2) possible acute condition in the abdomen, either appendicitis or ectopic pregnancy. The immediate treatment was supportive with close observation.

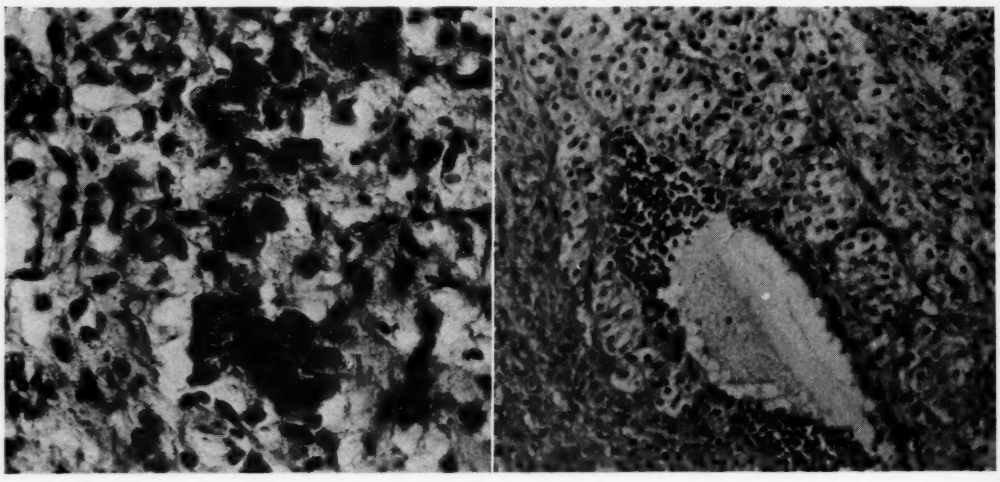
A laparotomy was done forty-eight hours later because of persistence of symptoms after premature labor was ruled out. The operative findings were an intrauterine pregnancy of twenty-two weeks' gestation, and a large ovoid solid tumor of the right ovary. It was about 20 cm. in the longest diameter and had twisted, together with the right adnexa, one-half turn. The tumor, tube, and ligaments were completely hemorrhagic. A right salpingo-oophorectomy was done.

Pathologic Examination.—The specimen was a large ovarian neoplasm and an oviduct. Both were completely hemorrhagic through their entire substance. There were large dilated and thrombosed veins in the broad ligament and mesosalpinx. The histologic picture was obscured by the extensive hemorrhagic infarction of all parts of the tumor. Sections showed small bundles of fibrous tissue separated by blood cells which seemed to permeate even between the individual fibrils (Fig. 3). The cells of the tumor itself were fibroblasts. The fibrils stained blue with Mallory's connective-tissue stain. Fat stain on frozen section was negative for lipid material.

Diagnosis.—Fibroma.

Forty-eight hours postoperatively, there was spontaneous delivery of a living but extremely premature female who died.

Follow-up examination of the patient in May, 1949, found her to be essentially normal although the hypertension was still present.



A. *B.*

Fig. 4.—*A*, Leydig cells in another area of the same tumor. (High power, hematoxylin and eosin stain.)

B, Tumor embolus in large blood vessel, Case 5. Note large, clear cells around the vessel, extending out both ways underneath the capsule. (Low power, hematoxylin and eosin stain.)

CASE 5.—R. E. H., aged 17 years, primigravida, was first seen Aug. 17, 1948, at thirty-two weeks' gestation. Blood pressure was 204/130 and there was slight edema. A diagnosis of severe pre-eclampsia was made and appropriate treatment started. Careful examination of the abdomen showed a tumor about 18 cm. in diameter separate from and to the left of the uterus. The patient had felt a mass in the left side for two years, gradually growing in size; she was afraid to see the doctor. There was pain in the left side for the past year. Menarche occurred at 14 years of age. The menses were regular in frequency, duration, and amount. No irregularity was noted until amenorrhea with the onset of pregnancy. The patient was treated medically for 48 hours and then cesarean section was done for (1) abdominal tumor, and (2) severe pre-eclampsia.

Cesarean section produced a 4 pound, 14 ounce normally developed, living, female baby. There was a large solid tumor arising from the region of the left ovary, extending all the way up to the subcostal margin. It was soft, encapsulated, and about 20 cm. in longest diameter. Its surface was smooth with no external sign of degeneration. A left salpingo-oophorectomy was done.

Pathologic Examination.—The tumor was yellowish white, moderately soft, and measured 22 by 15 by 6.5 cm. The cut surface had the same color, and was homogeneous except for several coarse trabeculae. There were a few small cystic areas near the center containing clear fluid, with evidence of old hemorrhage in some areas. Histologically the major portion of this tumor consisted of small hyperchromatic round or oval cells which had no distinctive characteristics. There were areas of cells near the periphery of the tumor, under the capsule, and around vascular spaces, which had all the characteristics of interstitial cells of the testis. In these places some cells were round or polyhedral, fairly large, with abundant pink granular cytoplasm (Fig. 4, *A*); other cells were vacuolated with only the cell membrane and nucleus remaining (Fig. 4, *B*). The small nuclei stained deeply. In a few areas there were large vacuolated cells arranged in clusters suggesting imperfect tubules. Around the periphery of the tumor on one section there were parallel cords of cells. The capsule was fibrous tissue with many vascular spaces underneath. There was a tumor embolus within one of the sinuses.

Diagnosis.—Arrhenoblastoma.

On April 19, 1948, eight months later, examination was essentially negative. The menstrual cycle was regular and normal.

CASE 6.—E. L., aged 34 years, para iv, first noticed pain in the left lower abdomen four weeks after delivery. The pain was occasioned by stooping, straining at stool, or coughing. She had had one normal menstrual period since her baby came. Abdominal examination done at time of delivery was recorded as normal. Delivery was spontaneous and the patient was discharged on the fifth postpartum day. Pelvic examination for the present complaint showed a normal uterus, and a left adnexal mass 6 cm. in diameter, firm and freely movable. She was admitted to hospital for laparotomy.

At the time of operation the findings were a normal uterus and right adnexa; the left ovary was replaced by a 6-cm. mass, which was encapsulated and firm. A left salpingo-oophorectomy was done.

Pathologic Examination.—The ovarian tumor measured 5.6 by 5 by 4 cm. Cross section of the specimen showed that the tumor itself was completely surrounded by ovarian tissue thinned out. The histologic picture was typical Brenner tumor. The bulk of the section consisted of fibrous tissue which stained green with Masson's trichrome stain. Interspersed throughout were the characteristic epithelial cell nests with their uniform polyhedral cells.

Diagnosis.—Brenner tumor.

Comment

Any solid ovarian tumor which is common in younger women logically may be expected to complicate pregnancy. This is clearly illustrated by the dysgerminoma which accounts for about 25 per cent of all solid ovarian tumors in pregnancy. In this study each of the tumors was either one of the special solid tumors or a fibroma. None was a solid adenocarcinoma, sarcoma, or teratoma, although some of these have been reported. Far too few solid ovarian tumors in pregnancy have been catalogued to permit any conclusions concerning incidence. In our study the incidence was about one in ten thousand deliveries. Notwithstanding such chances, four of the tumors occurred within eight months and two of these were found within a forty-eight hour period.

Admittedly, these are rare tumors, but our experience, as that of others, proves that they are dangerous; therefore it is essential that they be recognized.

This is difficult. Although a possible diagnosis of solid ovarian tumor was made in all but one of our patients it was the probable diagnosis in two patients only. Often it is difficult to differentiate solid from cystic tumors, a fact emphasized by Mechler in the discussion of Haas' paper.[34] The consistency usually helps to differentiate the cysts and cystomas from the solid tumors. Greater difficulty is had in differentiating pedunculated subserous myomas. An important distinguishing feature is mobility, often extreme. Sometimes the tumor may lie in the opposite side of the abdomen, again it may be up under the costal margin or deep in the cul-de-sac. Most myomas, by contrast, have less mobility and are usually found attached to or immediately beside the uterus. Often there are similar smaller myomas within the uterine wall.

Why do the solid ovarian tumors present such troublesome complications especially when contrasted with the cysts? There appear to be several good reasons, the first of which is mobility. The usual mobility of these tumors is increased by the softening, elongation, and engorgement of the ovarian and infundibulopelvic ligaments during pregnancy. Such relaxation in the presence of a heavy solid tumor will certainly favor torsion, infarction, and tumor previa. These serious complications were common in our patients as well as in those of other observers.

Rapid growth of the tumor is to be expected because of the marked vascular engorgement of pregnancy. Case 3 illustrated this much too well. An abundant blood supply produced rapid growth of the thecoma. As the tumor growth increased, degeneration followed, so that changes in position and pressure during delivery produced a rupture of the capsule and an overwhelming, rapidly fatal hemorrhage. With such a growth potential a tumor may be small early in pregnancy, and quite large by the end of gestation. The size of these tumors becomes critical when greater than 10 cm. in diameter. The critical period is the last half of pregnancy when the uterus rises high in the abdomen.

Other complications not noted in this study may arise. Many of the tumors earlier described were malignant. In general, the reproductive age is not the one for cancer, so malignancy should not be common. Nevertheless, there is general agreement that the special ovarian tumors possess some degree of malignancy. Certainly these tumors do appear during reproductive life. There may then be more urgency to remove such tumors because of the threat of malignancy.

In the absence of laboratory control we can but speculate about the endocrine function of these tumors. None of our patients exhibited clinical evidence of abnormal endocrine function. Neither of the patients with arrhenoblastomas had masculinizing symptoms though these have been described in pregnancy.[18] Whether or not increased production of estrogens could be recognized clinically is problematical. The high estrogenic levels during normal pregnancy and the lack of abnormal response reported following large doses of estrogens in pregnancy suggest that hyperestrinism might be overlooked.

These findings in general are in contrast to those of Haas,[34] and others[35, 36] who have reported that adnexal cysts during pregnancy are relatively innocuous. It is possible that the reports of solid ovarian tumors during pregnancy are more likely to find their way into the literature if complications are present. However that may be, our own experience suggests that there is far greater danger from solid than from cystic ovarian tumors.

It is, of course, neither possible to make rigid rules of treatment nor is it in the best interests of the patient. Nevertheless, we believe that all solid ovarian tumors greater than 10 cm. in diameter should be removed promptly when diagnosed or seriously suspected regardless of the duration of gestation. There are undoubtedly those who believe that any solid ovarian tumor regard-

less of size, or of gestation for that matter, should be promptly removed. Others might be deterred by a fear of postsurgical abortion. There is some danger of abortion if surgery is done during the first or second trimesters. One of our patients had a late abortion after surgery and there was one other reported, making a total of incidence of about 5 per cent. Certainly, the limited danger of postsurgical abortion should not restrain the physician from proper management. The extent of the surgical intervention is usually governed by the clinical findings and the stage of gestation. During pregnancy the solitary localized tumor can be removed and nothing more. At term the oophorectomy is usually accompanied by cesarean section. If there is evidence of overt malignancy, then bilateral salpingo-oophorectomy and hysterectomy should be done regardless of the duration of gestation.

The prognosis when based on reported experiences is not good. Certainly our results, one maternal and two infant deaths in six cases, can and will be improved.

Summary and Conclusions

1. Solid ovarian tumors as a complication of pregnancy are probably not as rare as the literature implies. Only thirty cases have been found in the world's literature of the past fifteen years. Yet six additional cases have been observed at the Charity Hospital at New Orleans during the past ten years, an incidence of approximately one in 10,000 deliveries.

2. The pathologic distribution was as follows: two arrhenoblastomas, two fibromas, a thecoma and a Brenner tumor.

3. Endocrine dysfunction was not noted.

4. Serious complications such as tumor previa, torsion, degeneration, rupture, and metastasis were common in the experiences of others as well as in our own. This is in contrast to the behavior of cysts and cystomas. One-half of our patients had major complications such as tumor previa, torsion, and rupture with fatal hemorrhage. The size and weight of the tumor, the extreme mobility, and the rapid growth play important roles in the production of complications.

5. Solid ovarian tumors greater than 8 or 10 cm. in diameter should be promptly removed as soon as diagnosed or seriously suspected. Smaller tumors, if not immediately treated, should be very closely observed with the full realization of the danger of malignancy.

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Discussion

DR. J. MILTON SINGLETON, Kansas City, Kan.—It is interesting to observe that with only thirty cases of solid ovarian tumor reported in the literature of the past fifteen years, six cases should be reported from one hospital in the past ten-year period, four of them within eight months and two within forty-eight hours. Such vagaries stress the necessity and importance of meticulous histories, thorough and systematic physical examinations, and complete and regular prenatal examinations with abdominal and uterine palpation, and, nearer term, rectal examinations to observe the status of the birth canal.

The authors have stressed the difficulty of diagnosis. The dictum of Jeff Miller, Polak, and others was that a fibroid could be safely watched, but that an ovarian cyst, when diagnosed, was an indication for early operation because of the ever-present danger of torsion or malignant degeneration. It is true that each patient requires individualization, and the authors stress the danger attendant on the tumor over 10 cm. in diameter, setting that as a possible border line for operative intervention. The occurrence of a 5 by 6 cm. papillary cystadenocarcinoma removed on the service of Hugh Hamilton at fourteen weeks' gestation and a solid carcinoma of 6 cm. diameter postpartally suggests that size is no criterion of the pathologic condition inherent in a given tumor.

The time of operation in the first half of pregnancy is less important with the advent of suitable hormone therapy and less depleting methods of anesthesia. Certainly, delay into the second half will lead to an increase in complications and maternal morbidity and mortality and a lessened salvage of infant life.

DR. LUND (Closing).—The question of tumor size was referred to. I am not at all certain that the 10 cm. size is critical. At least in our experience, once this size is reached, there may be serious symptoms from torsion, infarction, and necrosis. The dangers from smaller tumors, in terms of malignancy, must not be forgotten, and there may be a very distinct place for surgical interference in patients with smaller tumors.

UROLOGICAL ASPECTS OF GYNECOLOGY*

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DURING the past quarter of a century much emphasis has been placed upon the desirability of the training of the gynecologist in the fundamentals of obstetrics. Advantageous as this may be, it is no less important for the well-trained gynecologist to be grounded in the gynecological and obstetrical aspects of urology. Anatomically, pathologically, diagnostically, and therapeutically, the generative and urological systems are closely related and a knowledge of both is essential to the best work in our field. For example, three important diseases, carcinoma, tuberculosis, and gonorrhea, are no respecters of the narrow anatomic delineations which separate the two systems. Benign as well as malignant tumors of the generative organs encroach upon and sometimes injure the urinary tract. Pregnancy has a marked and sometimes serious effect upon the ureters and kidneys. One of our chief therapeutic weapons, irradiation, often has a side effect upon the urinary tract in addition to its principal effect upon the pelvic tumor. Finally, the bladder and ureters are structures that must be given serious consideration during pelvic surgery. It is my purpose in this paper to call attention to a few of the specific conditions in which both systems are involved.

It has been amply proved clinically and at autopsy that malignant tumors of the generative organs, especially cervical cancer, eventually involve the ureters and that the most common cause of death in cervical carcinoma is the resulting renal insufficiency. That benign pelvic conditions may cause damage to the urinary tract, which in some instances is serious, is not as generally appreciated. Working in the urological division of our clinic Everett and Sturgis[1] showed that in 50 per cent of a group of 100 cases of benign pelvic disease the upper urinary tract showed dilatation as a result of inadequate drainage due to pressure of the pelvic tumor or displacement and kinking of the ureter from uterine prolapse. The incidence of unilateral or bilateral ureteral dilatation in the various benign lesions was as follows:

Large fibroids	53 %
Benign ovarian cysts	40 %
Ovarian carcinomas	60 %
Pelvic inflammatory disease:	
Chronic salpingitis	44.4 %
Subacute salpingitis with masses	58.3 %
Pelvic abscesses	57.2 %
Complete procidentia	25 %
Incomplete prolapse with cystocele	10 %
Cystocele without prolapse	0 %

*Presented by invitation, at the Seventeenth Annual Meeting of the Central Association of Obstetricians and Gynecologists, Oklahoma City, Okla., Nov. 3 to 5, 1949.

Thus a high percentage of all of these common lesions, except uncomplicated cystocele, interfered with ureteral drainage.

What practical clinical suggestions can be gleaned from these facts?

Not infrequently fibroids of considerable size are entirely asymptomatic. In general, it is sound teaching that asymptomatic fibroids should not be removed and there is no doubt that many such fibroids are unnecessarily operated upon by ambitious surgeons. However, before disposing of a patient with such a tumor a urological study is in order to determine the status of the upper urinary tract. Since ureteral obstruction with resulting upper tract dilatation can and often does occur without any discomfort, one cannot dismiss the possibility of interference with drainage of the upper urinary tract on the basis of absence of symptoms. The presence of demonstrable ureteral compression in an asymptomatic fibroid is in our mind an indication for operative interference. This is particularly applicable to relatively large asymptomatic fibroids discovered in postmenopausal women. Likewise, in cases of prolapse in which direct symptoms scarcely necessitate correction, investigation of the upper urinary tract may indicate the advisability of surgical correction. With simple cystocele without prolapse the possibility of ureteral obstruction is practically nil.

The high incidence of ureteral dilatation with large fibroids and ovarian tumors indicates how frequently they impinge directly upon the ureters. Before laparotomy for the removal of such tumors catheterization of one or both ureters may save much operative time and worry and the chances of ureteral injury will be greatly reduced. This is particularly advisable when the pelvic examination suggests that the fibroid is intraligamentary or when the fibroid or ovarian tumor seems adherent, due to inflammation or infiltration of a malignant growth.

In this same series of 100 cases Everett and Sturgis demonstrated distortion of the bladder by pelvic masses or cystocele in 30 per cent. This in itself often is not serious, especially when the distortion results from fibroids. However, in 26 per cent of the 100 cases urinary tract infection was present, suggesting that the distorted bladder is often not emptying itself normally and is thus predisposed to infection. Also, bladder symptoms were present in 46 per cent of these cases. Since the percentage of symptomatic bladders was higher than the percentage of infection, it is apparent that mere anatomic distortion of the bladder may be responsible for symptoms.

Reduced renal function was present in 10 per cent of the cases with benign pelvic tumors and a subsequent study by Everett and Scott[2] of 200 patients with benign pelvic conditions revealed that hypertension occurred much more frequently in women with pelvic masses and prolapse than in a control group. Furthermore, in 100 of these cases that were studied completely urologically the incidence of hypertension was more than twice as great in those women with ureteral dilatation as in those without.

There is then the possibility that benign gynecological lesions may, on occasion, be a factor in the production of hypertension. This offers a possible explanation for the "myoma heart" of the literature of earlier years. It also emphasizes that ureteral dilatation may be a warning not to defer surgical correction of the pelvic condition too long.

The changes in the urinary tract during pregnancy have been recognized since 1843 when Cruveilheir first described ureteral dilatation. This dilatation has been shown by Traut[3] to be present in over 80 per cent of pregnant women. In recent years much clinical and experimental work has been done in an attempt to determine whether simple pressure of the gravid uterus or the effect of the pregnancy hormones is responsible for this dilatation of the ureters and kidney pelves. Hundley[4] and his associates concluded that the softening effect of the hormones on the ureters is an important one. On the other hand, the fact that the right-sided dilatation is greater than the left would suggest that pressure of the gravid uterus upon the pelvic brim is the major factor since the dextrorotation of the uterus during pregnancy would cause it to exert more pressure on the right. Also, the sigmoid colon would have a tendency to protect the left ureter. Furthermore, dilatation rarely occurs below the pelvic brim which would be likely if the hormonal effect were the major one. Those who believe that the hormonal effect is the principal one have suggested that the soft pregnant uterus cannot be a great source of pressure. However, Kretschmer and Kanter[5] found a higher incidence of ureteral dilatation in patients with large ovarian cysts than with large fibroids.

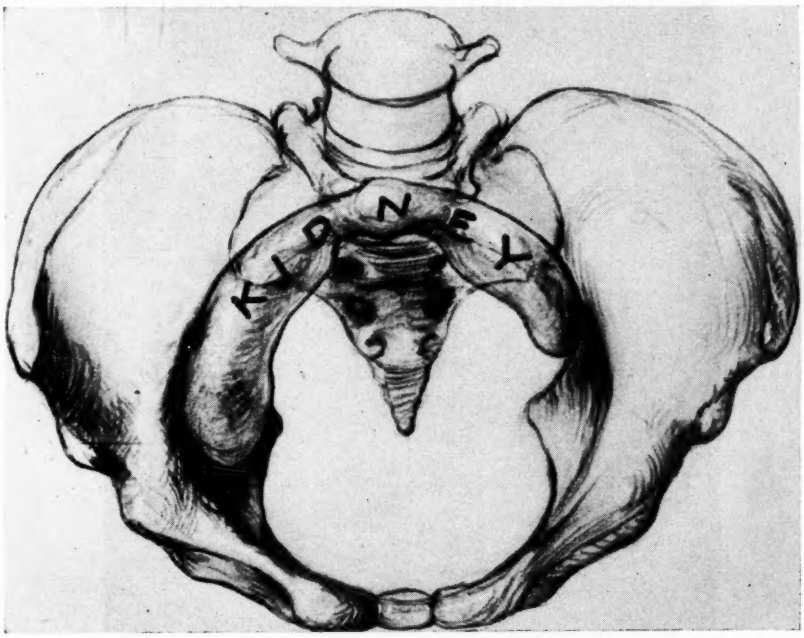

Fig. 1.—Schematic picture of horseshoe kidney.

An excellent clinical experiment presented itself to us in the form of a patient with a pelvic horseshoe kidney (Fig. 1). She was not pregnant when first seen and Fig. 2 shows the intravenous urogram. Subsequently she became pregnant and intravenous urograms which were made repeatedly during pregnancy failed to show ureteral dilatation (Fig. 3). Here, then, was a patient in whom the hormones of pregnancy had their full effect but since the ureters did not cross the pelvic brim the element of pressure could be excluded and there was no ureteral dilatation.

Regardless of the causal factors, the clinical fact remains that this stasis predisposes pregnant women to upper urinary tract infection and is not in-

frequently a factor in lighting up existing subclinical conditions such as mild infections and calculi.

Considering now the relation of pelvic malignancy to the urinary tract, this important question may be asked: What have urological studies contributed to our knowledge of cancer of the cervix from the standpoint of prognosis and treatment? Fig. 4 shows the urinary tract of a patient with advanced cervical carcinoma. We know that such a patient is not far from death but what is the prognostic significance of ureteral dilatation in less advanced cervical cancer?

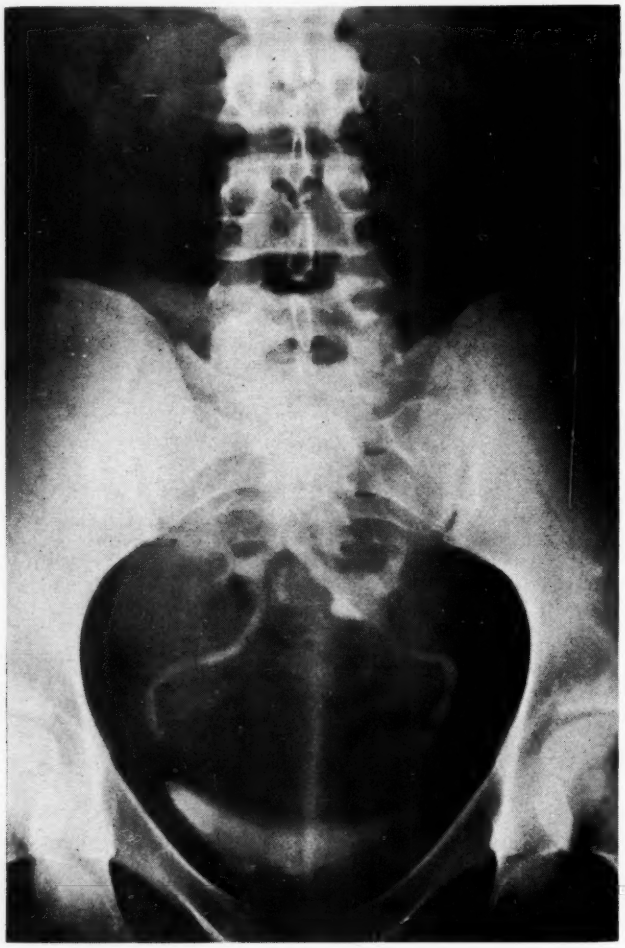

Fig. 2.—Intravenous urogram showing kidney pelves and ureters before pregnancy.

For several years it has been routine to investigate our cases of cervical carcinoma before and after treatment. In 1934, Everett[6] reported 46 cases of cervical cancer in which the urinary tract had been completely investigated. In none of the cases in which the neoplasm fell into Stages I and II (League of Nations) was there any demonstrable ureteral obstruction. In 57.1 per cent of the cases falling into Stage III there was ureteral obstruction. No Stage IV cases were included in the series. The interesting fact came out of this study that all of the women with Stage III carcinoma showing ureteral dilatation died of cancer, indicating the grave significance of ureteral obstruction resulting from broad ligament extension of the carcinoma. Another significant fact came

from this study. There were twelve patients in the series who were classified by pelvic examination as belonging in Stage III. None of these showed ureteral obstruction or dilatation and nine of the twelve were well after five years, suggesting that the parametrial thickening was probably of an inflammatory nature. Everyone experienced in cervical cancer knows how difficult it is to be certain, at times, whether broad ligament thickening is due to carcinoma or inflammation. Apparently urological investigation offers a means of shedding light on this question.

Fig. 3.—Intravenous urogram showing no essential change in contour of kidney pelves and ureters near term.

Damage to the urinary tract by irradiation may make a woman miserable for the rest of her life even though she be cured of the malignancy. Dean[7] and others have called attention to the effects of irradiation for cervical cancer upon the urinary tract. He has described the primary erythema which appears within twenty-four hours after treatment, the secondary erythema appearing three to four weeks after treatment, and the more serious tertiary ulcerations. The symptoms from the primary lesion are transient frequency and dysuria. The secondary cystitis is characterized clinically by painful and frequent urination and a burning discomfort in the bladder region. The patient may

usually be kept relatively comfortable by the palliative treatment of cystitis and the symptoms usually subside within a few weeks. The tertiary lesion seldom makes its appearance in less than one year and we have seen it appear twelve years after irradiation treatment. It is a serious lesion and the one that concerns us most. The lesion is the end result of ischemia due to fibrous obliteration of the vesical blood vessels and is usually on or near the trigone.

Fig. 4.—Pyeloureterogram of patient with advanced carcinoma of the cervix.

Small indolent ulcers appear first and eventually there is sloughing of much of the bladder wall. If the sloughing is extensive enough a vesicovaginal fistula may result. The ulcer in the sloughing stage as viewed through the cystoscope appears very much like a necrotic infiltrating bladder carcinoma. Biopsy is necessary to make the diagnosis and even with this the diagnosis may not be easy because of necrosis of the tissue. The symptoms are extreme dysuria and frequency. Bladder irrigations, Cajedrol instillations and picking away of the necrotic tissue through the cystoscope may augment healing but healing may require many months. Indeed, some have advocated transplantation of the ureters into the bowel but we have not found this necessary.

Since these lesions occur at or near the ureteral orifices, one of the more serious sequelae is fibrosis about the orifices resulting ultimately in interference with drainage and destruction of kidney function. Fig. 5 illustrates a functionless kidney resulting from this sequence of events. Prophylactic ureteral dilatation by means of bougies may prevent the destruction of the kidney such as occurred in this case.

Studying our cases of carcinoma of the cervix treated by irradiation prior to 1939, Everett[8] found that 48.3 per cent showed some evidence of ureteral obstruction and 54.5 per cent some type of bladder lesion. In only about 15 per cent, however, were the ureteral obstructions sufficiently marked to be of clinical importance and in only 20 per cent were the bladder symptoms of serious clinical significance. Although in many of these patients less than five years had elapsed since the treatment, all of them appeared to be clinically well of carcinoma. It was therefore assumed that the effects observed on the urinary tract were the result of irradiation rather than persisting cancer. In restudying this group later Everett, Brack, and Farber[9] found that one patient in whom there was only a mild bladder reaction subsequently developed dense ureteral

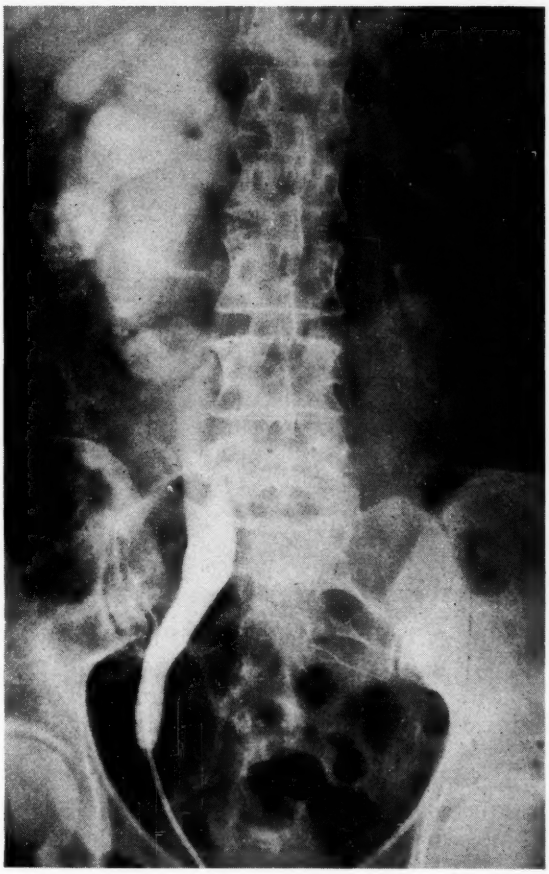

Fig. 5.—Hydroureter and hydronephrosis which have developed as the result of scarring from healed tertiary bladder ulcer from irradiation of cervical cancer.

strictures. Another patient who showed no urological lesion at the first examination subsequently developed a vesicovaginal and rectovaginal fistula and complete occlusion of one ureter with a large hydronephrosis. Both of these late lesions appeared to be the result of irradiation as there was no evidence of persistent carcinoma.

In the foregoing series, an average dose of 3,000 mg. hr. radon was given and in some the dosage was even less. Several of these patients received no roentgen therapy. However, in all of them, the radon had been administered

rapidly by the use of 2 to 3 Gm. equivalents of radon for one hour. The patients were not anesthetized and therefore the vagina could not have been packed as carefully as in our later series.

In 1940 our technique of treatment was changed and Everett, Brack, and Farber[9] have just completed a comparative study of a series of cases treated since then. These patients were all treated under anesthesia, and those in Stages I and II (League of Nations) received 4,800 mg. hr. radium to the cervix in two divided doses of 2,400 mg. hr. at an interval of two weeks. One hundred mg. of the element were used for twenty-four hours, one-half the radium being applied intracervically and the other contracervically. This treatment was followed by a total of 8,000 or 10,000 r of ray therapy begun two weeks after the last radium treatment. In the advanced cases, x-ray was administered first and radium applied afterward, if there was a satisfactory response to x-ray.

In this later series treated with the technique just described there was no demonstrable injury to the urinary tract that could be attributed to radium. Six per cent of the patients of this group developed vesicovaginal fistulas but these fistulas all occurred in patients who died of cancer in less than five years and it is assumed that the fistulas were the result of extension of the cancer. The absence of urinary complications in the "cured" cases of cervical cancer plainly indicates that the administration of radium in divided doses over a longer period of time under anesthesia with careful packing of the vagina is a safer and better method of irradiating the carcinomatous cervix. The results also show that x-ray therapy as used in this series is not harmful to the urinary tract.

One of the rarer urological conditions which the gynecologist encounters is diverticulum of the urethra. The etiology is usually obscure. It is probable that in some instances a diverticulum is the sequel to a suburethral abscess but we have encountered urethral diverticula completely lined by the urethral type of epithelium showing no evidence of inflammation in the wall. Nevertheless, infection is usually present and burning and frequency of urination are the most common symptoms. Pain, incontinence, strangury, hesitation, and retention are less frequent complaints. The most common finding is a bulging mass in the suburethral region simulating a simple urethrocele. Pus may usually be expressed from the urethral meatus and blood and/or pus may be present in the urine. In a few instances calculi have been present in the diverticula.

The diagnosis is usually relatively certain from the examination but we have established the diagnosis with certainty by catheterizing the diverticulum through its urethral opening, using a small ureteral catheter through a Kelly cystoscope. The diverticulum and bladder are then filled with radiopaque substance. The resulting picture is shown in Fig. 6.

The treatment consists of complete excision of the wall and closure of the defect in the urethra. In order to avoid unnecessary injury to the urethra it it advisable to place a sound in it and open into the cavity of the diverticulum before the sac is cut from the urethra. I prefer not to place an indwelling catheter in the urethra against the suture line and hence the patient is permitted to get up to void immediately. When considerable reconstruction of the urethra has been found necessary, I have made a surgical vesicovaginal fistula to divert the urine temporarily.

During the past decade there has been renewed interest in the surgical cure of urinary incontinence in women. The experience in our clinic dates back to 1894 when Kelly[10] reported his results in the treatment of stress incontinence by simple plication of the vesical sphincter with mattress sutures of silk. This operation, although very useful, left something to be desired in a fairly large

percentage of the cases. In recent years we have modified the operation, using mattress sutures to plicate the full length of the urethra. If a urethrocele is present we bring together the fascia beneath the urethra for support. We have had satisfactory results with this plication operation in 90 per cent of the cases of stress incontinence. Most of the failures have been in elderly women in whom there was no cystourethrocele but in whom the musculofascial tissue was of poor quality. Several of these women were nulliparous. The failures probably were due to the fact that tightening of the poor quality circular urethral muscles still left the sphincter action below par. We have also failed in some cases in which fibrous tissue from previous operative procedures prohibited the muscle from contracting properly. In some of these we have been successful in restoring continence by freeing the periurethral adhesions and almost completely freeing the urethra from its attachments before plicating, as suggested by Kennedy.[11]

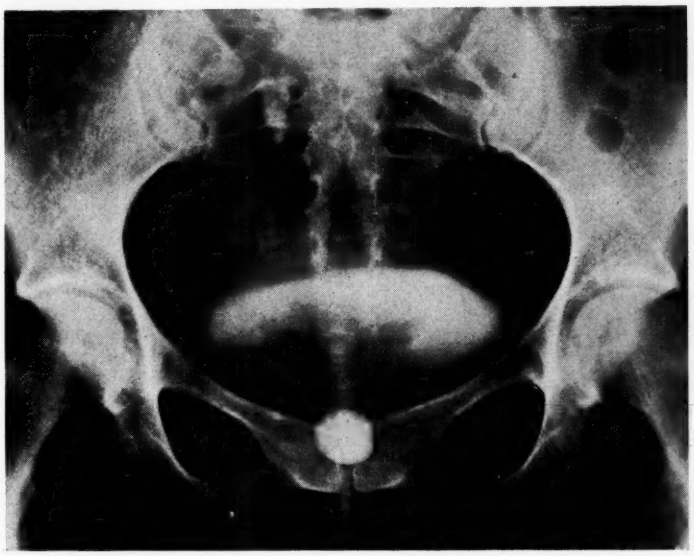

Fig. 6.—X-ray demonstration of urethral diverticulum.

There is a small but definite group of cases of stress incontinence in which we must bring in extraneous muscular or fascial aid to restore continence. In addition, we occasionally encounter cases in which the entire urethra is absent at birth or has been destroyed by destructive surgery or lymphopathia venereum. First a urethra must be constructed and then a sphincter formed. To restore sphincter action to this more difficult group various types of the fascial sling operation have been used extensively in the past decade. We have used the Aldridge[12, 13] modification of the Goebell-Stoeckel operation more frequently than any other and on the whole our results have been satisfactory. Our failures have been chiefly limited to the more difficult cases in which the tissues were much fibrosed from healed lymphopathia venereum and to cases of spina bifida in which urinary tract infection fared badly after damming up the bladder. More recently two new operations have made their appearance which have for their objective the elevation of the urethra and/or the vesical neck by the retropubic approach. Marchetti[14] has attempted to do this by a series of catgut sutures fixing the urethra and vesical neck behind the symphysis and lower abdominal fascia. Millin and Read[15] have attempted elevation of the vesical neck by lateral strips of fascia from the aponeuroses of the external and internal oblique

muscles. The strips are made to perforate the bellies of the recti and are carried by means of a special forceps beneath the vesical neck which is identified by an indwelling mushroom catheter. Satisfactory results have been reported by the use of both of these methods. They have the advantage over the Goebell-Stoeckel type of operation in that they can be done entirely through the one suprapubic field and contamination from the vagina is eliminated. There would seem to be greater danger of injuring the urethra, however, from the retropubic approach than when the urethra is exposed from below. It is too early to evaluate these three types of operation completely. Perhaps each will be found useful in its proper place, but certainly it can be said that they constitute an advance in our ability to cure many of the more difficult cases of incontinence.

The principles of cure of vesicovaginal fistula are well known and I will make no attempt to cover that subject in this paper. There is, however, one point that I wish to make. I refer to the usefulness of the Latzko[16] method of closing fistulas at the apex of the vagina resulting from total hysterectomy. As a consequence of the great enthusiasm for total hysterectomy that exists today many total operations are being done by men whose surgical training and experience scarcely qualify them for this procedure. As a result, postoperative fistulas today far exceed those of obstetrical origin. These fistulas almost always occur at the apex of the vagina and they can be closed easily by partial colpocleisis as demonstrated by Latzko (Fig. 7). By utilizing the posterior as well as the anterior vaginal wall I have not failed in the closure of such a fistula and it is rarely necessary to close enough of the vagina to interfere with its function.

Finally, I should like to make a few remarks about operative injuries to the ureters during gynecological surgery. Prevention is of primary importance and preoperative ureteral catheterization in difficult laparotomies is of the greatest value. In performing the modified Wertheim operation for extremely early microscopic cancer we routinely catheterize the ureters and there have been no ureteral injuries. Nevertheless, if one does enough pelvic surgery he is likely eventually to be confronted at the operating table with an injured ureter. Ureteroureteral anastomosis can usually be done if the injury is high but if the ureter is cut in its lower part implantation into the bladder is generally easier and has a greater chance of success. When ureteroureteral anastomosis is done it should always be done over a ureteral catheter, threading one end up to the kidney pelvis and the other through the lower part of the ureter into the bladder. In suturing the ureter, end to end, very fine catgut should be used and tied very loosely to prevent sloughing of the precious ureteral wall. After the anastomosis is made the peritoneum should be closed over it and a cigarette drain placed extraperitoneally through a stab wound in the lateral abdominal wall. At the conclusion of the operation the patient is cystoscoped and the end of the catheter withdrawn from the urethra. The catheter should be left in the ureter for ten or twelve days. When implantation is done into the bladder the use of a ureteral catheter is optional, provided the operator has determined by palpation that a normal-feeling kidney exists on the opposite side. If there is any reason to suspect that the opposite kidney is not normal the implantation should always be done over a catheter. Postoperatively the bladder is kept empty by means of an indwelling catheter.

When by the appearance of symptoms and signs postoperatively it is evident that a ureter has been cut or ligated the inclination on the part of the operator is to repair the damage as soon as possible. Perhaps a sense of guilt for being responsible for the complication causes him to desire to relieve the patient immediately. To re-enter the abdomen a few days after an extensive pelvic operation, attempt to find the injury, and then to effect an anastomosis

may be an extremely difficult task. Since the injuries usually occur in the difficult laparotomies where extensive dissection has been done, edema and perhaps some infection make working with the postoperative tissues most trying. Evidence of damage to the ureter becomes manifest postoperatively by the appearance of signs and symptoms of pyelitis or the signs of ureterovaginal fistula. If the pyelitis persists for several days in spite of chemotherapy and antibiotics one must always consider the possibility of a ligated ureter. The diagnosis can usually be substantiated by the finding of an impassable ureteral obstruction when ureteral catheterization is attempted. If a ureterovaginal fistula is present the patient is usually afebrile as long as urinary drainage persists. If drainage continues for weeks it is well to follow the patient with intravenous pyelograms at intervals of about ten days in order to watch for the effect upon the kidney.

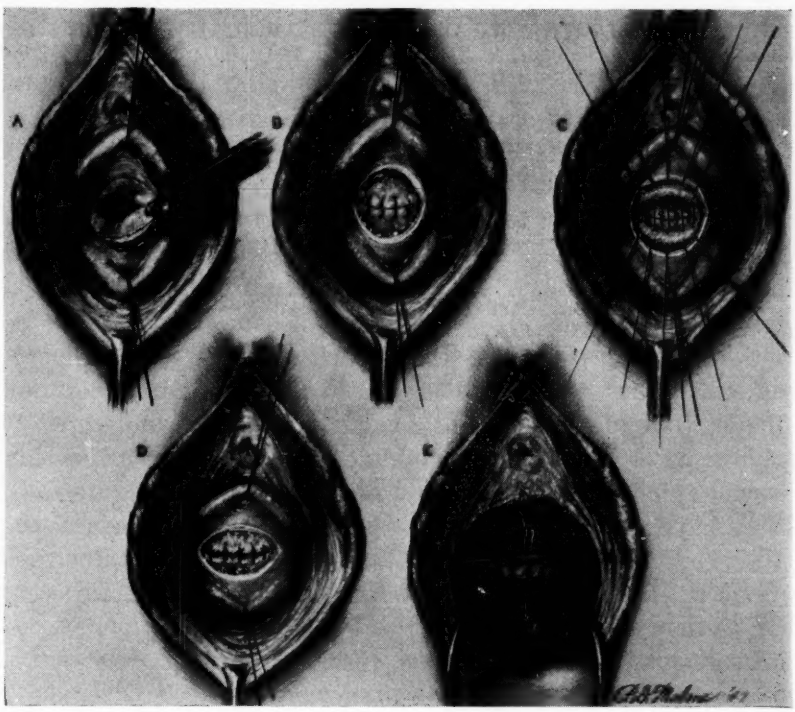

Fig. 7.—Demonstrating Latzko method of closure of vesicovaginal fistula by partial colpocleisis.

If no dilatation of the upper tract develops one may await re-entering the abdomen until the optimum time. However, as time goes on the fistulous tract contracts and with this it is common to witness evidence of back pressure on the ureter and kidney and clinical signs of pyelitis. Then a decision must be made as to the optimum time for re-entering the abdomen. Generally a period of at least six weeks should pass before the plastic work on the ureter is attempted. In the interim nephrostomy or pyelostomy may be done to preserve the kidney from the effects of back pressure and infection. It has been suggested by some gynecologists that the presence of a postoperative ureterovaginal fistula is an indication for nephrectomy. We do not subscribe to this defeatist point of view and believe that it arises from lack of urological training on the part of the gynecologists. Kidney tissue is too precious to be sacrificed unnecessarily.

There are many more phases of female urology that touch on gynecology. I have said nothing of the more common urinary tract infections which com-

plicate gynecological conditions and give rise to symptoms simulating disease of the generative organs. I have said nothing of the care of the urinary bladder after gynecological operations, an important subject from the point of view of the patient's postoperative comfort and also important from the standpoint of the prevention of rather serious sequelae. Time has prevented me from touching on many other phases of the subject but I hope I have cited enough instances of the close relationship between the urinary and generative tracts to justify my original assertion that all aspiring gynecologists should obtain basic training in urology.

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HOSPITAL CONTROL OF STERILIZATION AND THERAPEUTIC ABORTION*

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DURING recent years considerable attention has been given to sexual sterilization and therapeutic abortion. The eugenic and punitive use of sterilization as was practiced by the Nazi Germans has been discussed extensively by European physicians, while in America sterilization has received scant attention except as an adjunct phase of therapeutic abortion. The legal, economic, and moral aspects of abortion were reviewed critically by Taussig[6] in 1936 and his able discussion of indications delineates well the medical thinking of that time. However, then as now, no agreement could be achieved regarding either individual indications or general principles. The experience of the larger clinics has been detailed in medical journals.[1-5] Analysis of these reports shows that while certain indications are accepted with reasonable consistency, they also are sharply questioned on both medical and moral grounds.[1] It is obvious that the solution to the problems of the justifiability of therapeutic abortion, if indeed it ever is found, must contain a careful balance of its inherent medical, social, legal, and moral aspects. Voluntary sexual sterilization, while probably escaping the opprobrious charge of murder, raises many of the problems involved in therapeutic abortion. Sterilization, in basic concept, might be considered as prophylaxis against abortion.

Current social trends appear to be restrictive in effect. Employers have been forced to comply with certain health standards as a result of Workmen's Compensation laws. Employees have been forced to accept various medical insurance plans as part of their daily wage. Medical practice, too, is experiencing increasing constraint. Various medical groups, by concerted or directed action, have established restrictive regulations regarding qualifications for membership and the scope of the individual's practice. Laws now direct specific methods of treatment or prophylaxis for certain diseases. These trends indicate with undeniable certainty the gradual replacement of ethics by statute.

In medical practice the hospital assumes distinct obligations to both the physician and his patient. Upon such a tenet the medical staff control of sterilization and therapeutic abortion at our hospital has been developed. Because we believe that a method of control over these procedures can be established, we should like to present our experience. Abortion, whether therapeutic or criminal, has been carefully studied by others.[1-6] Consequently,

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the over-all legal and moral problems of abortion will be omitted. No attempt will be made to establish standards of justifiability for either therapeutic abortion or sterilization—such devolve from medical and sectarian ethics. However, since the legal aspect of sterilization is not well understood, this will be presented briefly so that current statutory provisions may be included in whatever general or guiding principles others may develop.

Legal Aspects of Sterilization

To obtain accurate information regarding the legal status of sterilization, a letter was written to the Attorney General of each state. Replies were received from all but three. We are deeply indebted to these public officials for the factual information regarding the legal aspect of sterilization and for pertinent and helpful suggestions which many of their answers contained. Critical articles in legal periodicals were studied. The data thus collected were discussed with members of the legal profession, including a Judge of Probate Court, to insure as far as possible the proper interpretation of this material.

TABLE I

States Which Have Enacted Sterilization Laws.—		
Alabama	Maine	North Carolina
Arizona	Michigan	North Dakota
California	Minnesota	Oklahoma
Connecticut	Mississippi	Oregon
Delaware	Montana	South Carolina
Georgia	Nebraska	South Dakota
Idaho	Nevada	Utah
Indiana	New Hampshire	Vermont
Iowa	New Jersey	Virginia
Kansas	New York	Washington
		Wisconsin
States Which Have Not Enacted Sterilization Laws.—		
Colorado	Massachusetts	Tennessee
Florida	Missouri	Texas
Illinois	Ohio	West Virginia
Kentucky	New Mexico	Wyoming
Louisiana	Pennsylvania	

The legal status of the sterilization laws of the various states is presented in tabular form (Tables I-V). Thirty-one states have passed sterilization statutes; fourteen have not (Table I). The status of such laws in three states could not be determined—Arkansas, Maryland, and Rhode Island (Table II). Review of the enacted laws by various courts resulted in some being declared unconstitutional, five of which were not subsequently amended or re-enacted. Thus, nineteen states are without effective statutes and only twenty-six states presently have laws which are in good legal standing (Table III).

TABLE II

States With Status of Sterilization Laws Unknown.—		
Arkansas	Maryland	Rhode Island
States Having Enacted Laws Declared Unconstitutional and Not Subsequently Amended or Re-enacted.—		
Delaware	New Jersey	Washington
Nevada	New York	

TABLE III

States Without Sterilization Laws or Laws Presently Not in Good Standing.—

Colorado	Massachusetts	Pennsylvania
Delaware	Missouri	Tennessee
Florida	Nevada	Texas
Illinois	New Jersey	Washington
Kentucky	New Mexico	West Virginia
Louisiana	New York	Wyoming
	Ohio	

The various statutes divide sexual sterilization into the following categories: therapeutic, eugenic, and punitive, relative to intent; voluntary and nonvoluntary, relative to consent (Table IV). All of the twenty-six existing laws provide for eugenic sterilization, five allow sterilization on therapeutic grounds, and five are punitive in nature. Provisions for hearings, reviews, and appeals were found in only a few of the statutes. The laws of Georgia and Indiana establish means for proper review of all proposed nonvoluntary or directed sterilizations as well as the right to jury trial and appeal. These states also require that the next of kin or legal representative be notified of the proposed sterilization so that legal action may be instituted as is provided.

TABLE IV. CLASSIFICATION OF STERILIZATION LAWS

	INTENT			CONSENT		
STATE	THERAPEUTIC	EUGENIC	PUNITIVE	NONVOLUNTARY AND VOLUNTARY	NONVOLUNTARY ONLY	VOLUNTARY ONLY
Alabama		x			x	
Arizona		x			x	
California	x	x	x	x		
Connecticut	x	x	x		x	
Georgia		x	x[3]	x[1]		
Idaho		x	x[4]	x[2]		
Indiana		x		x[3]		
Iowa		x	x[4]		x	
Kansas		x			x[5]	
Maine		x		x[6]		
Michigan		x		x		
Minnesota		x				x
Mississippi		x		x		
Montana		x		x		
Nebraska		x				x
New Hampshire		x				x[7]
North Carolina		x		x		
North Dakota	x	x		x		
Oklahoma		x	x[8]	x		
Oregon		x		x		
South Carolina		x			x	
South Dakota		x			x	
Utah		x		x		
Vermont	x	x		x		
Virginia	x	x		x		
Wisconsin		x			x	

[1]In nonvoluntary cases may request jury trial, may appeal decision.

[2]If consent of individual is not given, trial is held, appeal to Supreme Court permitted. If courts uphold Eugenics Board, sterilization is done.

[3]Hearing held in nonvoluntary cases; subsequent review and appeal provided.

[4]Punitive for criminals only.

[5]Hearing and appeal provided.

[6]Hearing provided; individuals may be compelled to submit to sterilization.

[7]Feeble-minded and epileptics must submit to sterilization to obtain license to marry.

[8]Punitive provisions held to be unconstitutional.

As far as could be determined, all the statutes now in force contained provisions for a board to initiate action for sexual sterilization (Table V). Sterilization being approved largely for eugenic reasons probably accounts for the statutory provisions for the operation on the feeble-minded, the insane, and those with inheritable defective disease while inmates in state institutions. Certain states specify the type of operation which must be performed to effect a legal sterilization, Connecticut alone requiring oophorectomy.

TABLE V. PROVISIONS OF STERILIZATION LAWS

STATE	INITIATING BOARD	FEEBLE-MINDED AND INSANE	HEREDITARY DISEASE	PERVERTS	WHILE INMATES IN STATE INST.	FOR PAROLE
Alabama	x	x			x	
Arizona	x	x	x		x	
California	x	x	x[1]	x	x	x
Connecticut	x	x	x		x	
Georgia	x	x	x		x	
Idaho	x	x	x	x	x	
Indiana	x	x[2]	x		x	
Iowa	x	x	x[1]	x	x	
Kansas	x	x[2]	x		x	
Maine	x	x	x		x	
Michigan	x	x[3]	x		x	
Minnesota	x	x	x		x	
Mississippi	x	x	x		x	
Montana	x	x	x		x	
Nebraska	x	x[2]	x	x		x
New Hampshire	x	x	x			x
North Carolina	x	x	x		x	
North Dakota	x	x	x	x	x	
Oklahoma		x				
Oregon	x	x	x	x	x	
South Carolina	x	x	x		x	
South Dakota	x	x	x		x	x
Utah	x	x	x		x	
Vermont	x	x	x		x	
Virginia	x	x	x		x	
Wisconsin	x	x	x		x	

[1]Includes syphilis.
[2]Includes epileptics.
[3]Excludes insane.

Existing statutes provide various grounds for the legal performance of sexual sterilization on inmates of state institutions. Physicians performing such operations upon individuals not wards of the state become liable according to the legal status of such procedures. To point out certain positive aspects of these laws, criminal liability, prohibitory and penal provisions, and voluntary sterilization will be considered briefly. Under Common Law, upon which the majority of the statutes is based and which is applicable in the absence of enacted law, any physician who performs an operation designed to effect sterilization may be criminally liable on two counts—homicide in the event of otherwise unexplainable death, and mayhem.[8] Mayhem requires that the maiming be done with legal malice. If consent to operation is freely given, malice generally is not deemed to have occurred. It should be emphasized that each state develops its own interpretations of its laws and that legal phraseology may produce unexpected complications. Thus, if the law of the state includes the words, *rendering useless*, applied to a member or an organ of a human being, there is a distinct possibility that a decision may be given which would establish the phy-

sician's liability under the law. The Connecticut statute makes a physician liable to a fine of up to $1,000 and/or up to five years imprisonment if convicted of performing a sterilizing operation, with or without the consent of the individual, unless it can be shown that it was done for medical necessity or in accordance with a specific section of the law.[10] Indiana,[11] Mississippi,[14] Utah,[15] and Virginia[17] incorporate the following in their statutes:

"Nothing in this act shall be construed so as to prevent the medical or surgical treatment for sound therapeutic reasons . . . which treatment may incidentally involve the nullification or destruction of the reproductive functions."

It must be remarked that the use of such phrases as *medical necessity* and *sound therapeutic reasons* follows the pattern of abortion laws. The difficulty of determining the exact meaning of these words has led to the advice given in the *Journal of the Indiana Medical Association*,

"To make as certain as human precaution can make it, that a physician might not be subjected to difficulties later on, he should have consultation with other physicians and ample evidence to prove that the abortion was actually necessary."[7]

Such sound advice should also be followed for sterilizing operations.

Prohibitory provisions for nontherapeutic, voluntary sterilization are contained in some statutes, that of Indiana providing "that such treatment shall be that which is legal and approved after due process of law."[11] Penal provisions are contained in others, as in Iowa,[12] Kansas,[13] and Utah,[16] where the laws state,

"Except as authorized by this act, every person who shall perform, encourage, assist in, or otherwise promote the performance of either of these operations (vasectomy and salpingectomy) for the purpose of destroying the powers of procreation, unless performance of such operation is a medical necessity, shall be guilty of a misdemeanor."

It appears evident that if a state has enacted a law containing prohibitory or penal provisions, the physician may become liable in performing a sterilizing operation, although properly evidenced *medical necessity* may avoid penalty.

Voluntary sexual sterilization, the principal concern of most physicians, has no definite legal status. To our knowledge, there is no case on record where an individual who gave consent for sterilization has brought suit against the physician for performing the operation. Hence, there is no precedent. However, in considering other types of operations, the Indiana Supreme Court decided that "a person cannot hold a physician liable for performing unreasonable surgery where he has requested the physician to do so."[7] Miller and Dean,[8] after reviewing liability involved in sterilization, conclude that in those states in which there are no prohibitory or penal provisions the general rule of tort law seems to apply. The consent of the individual to submit to the operation with full knowledge as to what it involves should be sufficient protection against civil liability on the part of the operating physician, provided that the operation was performed without negligence.

Another approach is presented in a review of the legal status of sterilization in Indiana. Indiana has a sterilization law pertaining to mentally defective individuals and others in state institutions which has been held to be constitutional. The review presents the argument that

"Voluntary sterilization would be lawful for the reason that the state could not treat its wards with severity or cruelty or engage in maiming them or committing mayhem on them. Therefore, if sterilization were to constitute any form of mutilation or injury to the body that could constitute mayhem, the sterilization law regarding inmates of state institutions could not be sustained. Since it is sustained, it follows that voluntary sterilization is lawful."[7]

Despite such legal assurance a word of caution must be introduced. Since there has been no case of voluntary, nontherapeutic sterilization brought before a court of law, there is no legal relief yet established for a physician made a defendant in such a case. Defense based upon eugenic or medical necessity considerations probably would be acceptable since such is provided for under existing statutes.

Hospital Control

About ten years ago, because of the evident equivocality of the legal and ethical aspects of therapeutic abortion, there developed among members of our hospital staff the concept that some protection, if only in the nature of kindly counsel, should be provided those who were ignorant of the existing problems. Counsel often is not cheerfully accepted, more frequently is disregarded, particularly when it suggests changes or curtailment of methods of practice. By training and experience, physicians tend to become fixed in their social and moral attitudes as well as in their solution of medical problems. Often, too, marked humanitarian impulses cloud professional vision. Thus, through ignorance, fixed opinion, and the special pleas of intimately known patients, proper medical treatment often lapses. In 1940, at a meeting of this association, Hesseltine[3] drew attention to problems relative to therapeutic abortion. This stimulated some of our staff to consider those which were present in our hospital. Study of the Michigan law revealed that while abortion could be performed legally, in the event of suit the physician had no legal protection and had to prove that he committed no unlawful act. Moreover, it appeared essential that two physicians recommend that therapeutic abortion was indicated. The entire question was brought before the members of the Division of Obstetrics and Gynecology for discussion, at which time cases of therapeutic abortion were reviewed. In certain instances it appeared that therapeutic abortion could have been avoided had adequate consultation been obtained and further study of the case been made. The discussion also revealed that many physicians were unaware of the legal feasibility of having the written recommendation of two consultants to avoid potential difficulties. Consequently, a committee of three obstetrician-gynecologists was appointed to review cases scheduled for therapeutic abortion. The conceived function of the committee was to protect the physician from inadvertent lapses, medical or legal, and to protect the patient from poorly considered interference. In effect, the committee was to guard the interests of both the physician and the patient. Originally no attention was given to the problem of sexual sterilization. Most usually this was done incidental to other abdominal surgery or in association with repeated cesarean section deliveries.

Reviews of proposed therapeutic abortions were continued during the war years despite a depleted, overworked staff. In 1946, with most of the members returned to private practice, critical reviews of hospital statistics were regularly resumed. Study of the therapeutic abortions and sterilizations performed during 1946 showed that while the number of therapeutic abortions was declining there had been a marked increase in the number of sterilizations. Inquiry into the legal status of sterilization in Michigan disclosed that there was neither a specific law nor any legal precedent for those done for noneugenic, nontherapeutic indications. Thus, any physician performing a sterilizing operation placed himself in a precarious position since in the event of suit he would have to defend himself on grounds of medical necessity. Accordingly, the Therapeutic Abortion Committee was directed to review all cases proposed for sterilization as well, and was given the power to prevent such operation without prior approval from the committee. This new committee was composed of the chiefs

of the Divisions of Medicine, General Surgery, and Obstetrics and Gynecology. Because in the majority of requests the indications were principally obstetrical or gynecological, the chief of this division became, by default, the sole arbiter. As a result, whenever the committee did not approve a request he became the target of both personal appeals and censure. With a revision of the rules and regulations of the medical staff in 1947, the Abortion and Sterilization Committee was made a permanent special committee and its members, appointed by the chief of staff, are anonymous and have been qualified obstetrician-gynecologists. The rule pertaining to this committee reads as follows:

> "All cases which involve the interruption of pregnancy before the fetus is viable and all cases in which sterilization is involved shall have prior permission from a committee composed of members of the active medical staff. Application for such permission shall be in writing and shall include the reasons for the procedure with an abstract of any pertinent medical findings and the recommendations of consultants, if such have been made. A copy of the letter of approval of the Abortion and Sterilization committee shall be made a permanent part of the medical record."

The minutiae of the committee's operation can be outlined quickly. The letter requesting approval of therapeutic abortion or sterilization is addressed to the chief of staff, the chairman of the committee, or the superintendent. The chairman receives it and reviews its contents to ascertain whether sufficient information is contained to warrant consideration of the request. If it appears to be in order it is given to the superintendent's secretary who notifies the members of the committee. The junior member of the committee considers the request first, giving his approval or disapproval in writing, adding whatever comment he believes pertinent, which is done invariably when the request is not approved. The letter then is presented to the other members of the committee, the chairman being the last to give his decision. Early in the committee's operation each written comment and decision was seen by all of the members of the committee. Since this tended to stifle disagreement, the various decisions now are kept separate until asked for by the chairman. The chairman finally reviews the opinions of the committee members. If there is disagreement he may either discuss the matter with the member involved, after which the opinion may be revised, or he may call the committee together for general discussion. In those instances where the indication for the procedure requested is principally in other medical specialties, the chief of the division concerned may be invited to review the case and give his opinion for the guidance of the committee. After a decision has been reached, the chairman prepares a letter of reply for the signature of either the chief of staff or the superintendent. When the request is approved, a copy of the physician's request along with the letter of approval is made a permanent part of the patient's medical record.

Analysis of Requests

The activity of the committee can be suggested by reviewing the requests received during 1947 and 1948. No attempt will be made to defend or criticize the decisions made, or can any analysis be made of the reasoning upon which approval or disapproval was given. Details of the approved cases will be omitted, brief comment being presented only to clarify somewhat those requests which were not approved. During 1947 the committee, composed of the chiefs of the Divisions of Medicine, General Surgery, and Obstetrics and Gynecology, received forty-five requests for approval of sterilization (Table VI). Thirty-eight were approved, seven not approved. These forty-five requests proposed seventy-three indications—thirty obstetrical, fourteen gynecological, thirteen medical, one surgical, and fifteen miscellaneous.

TABLE VI. REQUESTS FOR APPROVAL OF STERILIZATION, 1947

Requests received	45 cases
Approved	38 cases
Not approved	7 cases
Further information requested	2 cases
Subsequently approved	2 cases*

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Obstetrical	30	24	5	1*
Gynecological	14	13	1	0
Medical	13	11	1	1*
Surgical	1	1	0	0
Miscellaneous	15	8	5	2*
Total	73	57	12	4*

*Subsequently approved.

In the obstetrical group (Table VII), sterilization was not approved for five indications. Three of these were for sterilization at the time of a second cesarean section, one for a questionable prior toxemia, and one for a 41-year-old gravida iv, para i who had had three apparently spontaneous and uncomplicated abortions after a normal delivery of a full-term living infant. All the gynecological indications (Table VIII), except one, involved sterilization as an associated procedure at the time of major plastic repairs of the lower generative tract. The one exception, not approved, was for extensive vaginal and perineal lacerations in a 32-year-old gravida v, para iv. Here the committee advised that the patient be delivered and her status re-evaluated critically post partum. In the following year this same patient was proposed for sterilization at the time of elective repair of the lacerations and approval was given. Thirteen indications were medical (Table IX), all being approved except that of seronegative syphilis in the patient with extensive vaginal and perineal lacerations previously discussed. There was only one surgical indication for sterilization (Table X), carcinoma of the bladder in a 37-year-old gravida xi, para x for whom delivery by cesarean section was advised by the urological consultant.

TABLE VII. OBSTETRICAL INDICATIONS FOR STERILIZATION, 1947

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
One previous cesarean	10	6	3	1*
Multiparity	7	7	0	0
Two previous cesareans	6	6	0	0
Prior toxemia	4	3	1	0
Prior dystocia	1	1	0	0
Present disproportion	1	1	0	0
Prior repeated abortions	1	0	1	0
Total	30	24	5	1

*Subsequently approved.

TABLE VIII. GYNECOLOGICAL INDICATIONS FOR STERILIZATION, 1947

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Proposed extensive vaginal plastic repair	8	8	0	0
Proposed Watkins interposition	5	5	0	0
Extensive vaginal and perineal lacerations	1	0	1	0
Total	14	13	1	0

TABLE IX. MEDICAL INDICATIONS FOR STERILIZATION, 1947

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Arrested pulmonary tuberculosis	3	3	0	0
Rh incompatibility	2	1	0	1*
Rheumatic heart disease	2	2	0	0
Essential hypertension	2	2	0	0
Cardiovascular renal disease	1	1	0	0
Diabetes mellitus	1	1	0	0
Mental deficiency	1	1	0	0
Syphilis (seronegative)	1	0	1	0
Total	13	11	1	1

*Subsequently approved.

TABLE X. SURGICAL INDICATION FOR STERILIZATION, 1947

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Carcinoma of the bladder	1	1	0	0
Total	1	1	0	0

The group of miscellaneous indications (Table XI) suggest a *raison d'être* for the committee. Obesity appears to be a chronic disease in many women, psychosomatic in nature perhaps, but sterilization does not appear to be established as a mode of therapy. However, when obesity was combined with recurrent toxemia in a 39-year-old gravida ii, para i with fetomaternal disproportion, approval was given; when combined with alleged poor economic status and the personal request of the patient, approval was not given. Failure of contraceptive methods and devices in a 29-year-old gravida vi, para vi was not believed to be an indication for sterilization, although such was accepted for a 34-year-old gravida vi, para iii who had in her last two pregnancies delivered erythroblastic infants.

TABLE XI. MISCELLANEOUS INDICATIONS FOR STERILIZATION, 1947

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Obesity	3	2	1	0
Request of patient	3	1	2	0
Failed contraception	2	0	1	1*
Failed prior sterilization	2	2	0	0
Poor economic status	2	1	1	0
Physical disability husband	1	1	0	0
Extreme debility	1	0	0	1*
Deaf-mutism	1	1	0	0
Total	15	8	5	2

*Subsequently approved.

All the requests for therapeutic abortion received during 1947 were approved (Table XII).

During 1948 the committee was composed of three obstetrician-gynecologists who remained anonymous, which may account for certain differences in the actions taken. Twenty-six cases were presented for approval of sterilization (Table XIII), twenty-one being approved, three not approved. In four cases the committee asked that further information be submitted. This was supplied

in two instances and the requests then approved, while in the remaining two none was received and no action was taken. These twenty-six cases involved forty-six separate indications—seventeen obstetrical, four gynecological, twelve medical, five surgical, and eight miscellaneous.

TABLE XII. REQUESTS FOR APPROVAL OF THERAPEUTIC ABORTION, 1947

Requests received	3 cases
Approved	3 cases

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Carcinoma of breast	1	1	0	0
Arrested pulmonary tuberculosis	1	1	0	0
Prior eclampsia	1	1	0	0
Failed contraception	1	1	0	0
Total	4	4	0	0

TABLE XIII. REQUESTS FOR APPROVAL OF STERILIZATION, 1948

Requests received	26 cases
Approved	23 cases
Not approved	3 cases
Further information requested	4 cases
Information not submitted	2 cases
Subsequently approved	2 cases*

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Obstetrical	17	12	2	3
Gynecological	4	4	0	0
Medical	12	10	0	2*
Surgical	5	3	1	1
Miscellaneous	8	1	6	1
Total	46	30	9	7

*Subsequently approved.

In the obstetrical group (Table XIV), sterilization was not approved in two cases, both being requested principally for multiparity in young women. One asked for approval for a 34-year-old gravida ii, para i who, because of toxemia during the previous pregnancy, was delivered by cesarean section after which she developed a phlebitis. The request contained no information regarding the status of the patient during the present pregnancy and the committee asked that this be supplied. However, this was never received and no action was taken. In another, the request was made for a patient who after delivering a normal infant without event had two stillbirths in association with some symptoms of toxemia, followed by a normal pregnancy and the uneventful delivery of a living infant. Information regarding the current status of the patient was requested, but no reply was received and no further action taken. In the gynecological group (Table XV), sterilization was requested only when major plastic repairs of the lower generative tract were proposed. None was denied. There were twelve medical indications (Table XVI), all but two being approved without question. One, based upon diabetes mellitus, was approved after the medical consultant re-evaluated the patient and also recommended sterilization. The other concerned a 22-year-old gravida vi, para iii who had suffered a severe postpartum psychosis in her first pregnancy. The committee asked that the psychiatrist again interview the patient to establish her present status. This was done, the psychiatrist also strongly urging sterilization. The committee

then approved the request. Surgical indications were present five times and all but two were approved (Table XVII). One was that involving puerperal phlebitis following cesarean section already discussed. The other request was for a 21-year-old gravida ii, para i with residual atrophy from an old poliomyelitis. Neither obstetrical nor orthopedic consultation had been had. The committee advised that if such were obtained and the consultants also believed sterilization indicated, the request would be favorably reconsidered.

TABLE XIV. OBSTETRICAL INDICATIONS FOR STERILIZATION, 1948

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Two previous cesareans	7	7	0	0
Multiparity	4	2	2	0
Prior toxemia	2	0	0	2
One previous cesarean	2	1	0	1
Prior eclampsia	1	1	0	0
Bicornuate uterus	1	1	0	0
Total	17	12	2	3

TABLE XV. GYNECOLOGICAL INDICATIONS FOR STERILIZATION, 1948

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Proposed extensive vaginal plastic repair	3	3	0	0
Proposed Watkins interposition	1	1	0	0
Total	4	4	0	0

TABLE XVI. MEDICAL INDICATIONS FOR STERILIZATION, 1948

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Diabetes mellitus	2	1	0	1*
Chronic pyelonephritis	2	2	0	0
Rh incompatibility	1	1	0	0
Prior postpartum psychosis	1	0	0	1*
Emotional instability	1	1	0	0
Thyrotoxicosis	1	1	0	0
Chronic nephritis	1	1	0	0
Essential hypertension	1	1	0	0
Rheumatic heart disease	1	1	0	0
Arrested pulmonary tuberculosis	1	1	0	0
Total	12	10	0	2

*Subsequently approved.

TABLE XVII. SURGICAL INDICATIONS FOR STERILIZATION, 1948

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Varicose veins, lower extremity and vulva	2	2	0	0
Prior puerperal phlebitis	1	0	0	1
Previous nephrostomy	1	1	0	0
Residual atrophy, old poliomyelitis	1	0	1	0
Total	5	3	1	1

Miscellaneous indications were considerably reduced (Table XVIII). In two instances poor economic status was combined with multiparity as well as with other miscellaneous indications—failed contraception, obesity, and physical disability of the husband. These were not approved. Poor economic status was included in the requests for which there were approved medical and gynecological indications. Failed contraception was approved as associated with Rh incompatibility in a gravida vi, para iv.

TABLE XVIII. MISCELLANEOUS INDICATIONS FOR STERILIZATION, 1948

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Poor economic status	4	0	3	1*
Failed contraception	2	1	1	0
Obesity	1	0	1	0
Physical disability husband	1	0	1	0
Total	8	1	6	1

*Subsequently approved.

Four cases were presented for approval of therapeutic abortion during 1948, none being approved (Table XIX). Approval of both therapeutic abortion and sterilization was requested for a 36-year-old gravida iv, para ii for arrested pulmonary tuberculosis, thyrotoxicosis, and emotional instability. Despite the consultants' recommendations the committee did not approve the abortion, but did approve postpartum sterilization. In the other three cases the committee did not believe that sufficient information had been submitted—in one no consultation had been obtained—and asked that more complete data be supplied. None was received, however, and no further action was taken.

TABLE XIX. REQUESTS FOR APPROVAL OF THERAPEUTIC ABORTION, 1948

Requests received	4 cases
Approved	No cases
Not approved	1 case*
Further information requested	3 cases
Information not submitted	3 cases

*Requested sterilization approved.

INDICATION	NO.	APPROVED	NOT APPROVED	MORE INFORMATION
Reactive depression	1	0	0	1
Rh incompatibility	1	0	0	1
Prior toxemia	1	0	0	1
Prior postpartum psychosis	1	0	0	1
Prior puerperal phlebitis	1	0	0	1
Emotional instability	1	0	1*	0
Thyrotoxicosis	1	0	1*	0
Arrested pulmonary tuberculosis	1	0	1*	0
Total	8	0	3	5

Comment

In their purely medical aspects, therapeutic abortion and sterilization present no unusual problems. So considered they require simply that the treatment be proper for the disease involved. When their social, moral, and legal aspects are included, the problem ceases to be simple. There appears to be no fundamental disagreement that these operations may be performed on the grounds of medical necessity even though what constitutes such grounds may be divergently interpreted. Private patients with substantial financial resources frequently

are managed differently than staff patients existing on welfare allotments. Differences in treatment result also from differences in dogma. Legally both procedures are permitted, but the provisions admit a wide range of interpretation. In short, there are no definite, unvarying criteria which may be applied to the proper performance of these procedures. While we admit and believe that standards of justifiability must be established, we wish to emphasize that our present concern is only with the mechanism whereby control over therapeutic abortion and sterilization within the hospital may be attained.

The hospital is a social institution wherein the members of its staff join forces to make available the requisite professional tools and assistants to assure each patient the greatest possible benefits from medical skill and science. To attain this end further, the organized medical staff adopts certain rules and regulations. Standards of education, of training, and of practice are established. These determine in good measure the composition of the medical staff and the results which they obtain. Because the hospital as an institution and its professional staff as an organization assume obligations to the patients cared for, we believe that requiring the approval of a committee of physicians is a justifiable and desirable means of controlling the performance of therapeutic abortions and sterilizations.

Particular emphasis has been placed upon the legal aspects of sterilization. This was done, in part, to elucidate one phase of the total problem and to indicate some difficulties a physician might encounter. Committee control over the procedure eliminates many of these difficulties. A thoughtfully appointed committee whose members remain anonymous is in a position to examine each case in terms of its fundamental necessity and to give a totally unhampered opinion with complete medical honesty. Aided by the hospital's legal adviser the committee can be familiar with the abstruse provisions of existing statutes, thereby offering protection against legal liability. When composed of qualified specialists the committee will possess detailed knowledge of the proper management of the various complications which arise during the reproductive years, thereby assuring conformance to the best in contemporary medical practice. With the realization of the importance of its decisions the committee will conduct its deliberations on a high ethical plane, thereby avoiding the imputation of immorality to the procedures it approves. Thus the attending physician can be certain that any abortion or sterilization which he may do with the committee's approval will be legally defensible, medically indicated, and morally acceptable.

As the committee is functioning in our hospital we believe that these values can be achieved. Its decisions have provided certain positive guidance to the members of our staff. Comparison of the two years' activity reported shows that the requests were almost halved and that the indications proposed during 1948 conformed more to general medical practice. The success of the hospital committee control program appears due, in part, to the following factors:

1. The committee is a permanent committee of the medical staff.
2. Its membership remains anonymous.
3. The members are qualified obstetrician-gynecologists.
4. The committee does not act in lieu of consultation.
5. Approval must be obtained prior to the performance of the operation.
6. The physician's letter of request and the committee's letter of approval become a permanent part of the medical record.
7. The hospital's legal adviser keeps the committee as well as the medical staff informed of changes in the application of statutes.

Another way of assaying the value of our committee is the informal opinion of our legal friends as well as a Judge of Probate Court that if all physicians

could have the benefit of such committee approval for the performance of therapeutic abortion and sexual sterilization operations they would be as well protected from liability as presently appears possible.* Such a method as has been outlined appears to give that protection to both the physician and the patient which our changing social order seems to accept as equal in value to medical and moral ethics.

Summary

1. Current attitudes towards therapeutic abortion and sexual sterilization are reviewed.

2. The status and provisions of the sterilization laws of the various states are discussed and their practical application to physicians performing sterilization operations is suggested.

3. The method of control over sterilization and therapeutic abortion as developed by the medical staff of our hospital is given in detail.

4. Analysis of the actions taken by the hospital committee on the requests for approval of these procedures during 1947 and 1948 is presented.

5. It is concluded that control over sterilization and therapeutic abortion is a function of the hospital staff, that such can be achieved by a properly constituted committee, and that the method as employed at our hospital gives positive protection to both the patient and the physician.

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Discussion

DR. W. O. JOHNSON, Louisville, Ky.—The comments that I wish to make are my personal opinions. As stated by Dr. Taussig in 1936, in his discussion of indication for abortions, there is no agreement, nor is there likely to be, regarding individual indications or general principles of abortion and sterilization.

An analysis of this report shows that certain indications are acceptable with reasonable consistency, but some of these are sharply questioned on both medical and moral grounds. It is obvious that the solution to the problem must contain a careful balance of medical, legal, and moral aspects. As long as the race exists, we will have abortions and their inevitable sequelae. If we can get a basic concept that sterilization may be

*One suggestion was made which as yet has not been incorporated as a standard procedure. To protect himself further from civil suit the operating physician should have a letter, written and signed by both the wife and the husband, requesting that the procedure proposed be done, the implications of which they both fully understand. This should be in addition to the routine consent to operation which most hospitals obtain from the patient upon admission.

considered as a prophylactic against such sequelae, we have a broader viewpoint of the subject. With our current social trends, restrictive efforts are being encountered in every field of medicine. Various health groups are likewise playing their part, and within medicine itself, qualifications and regulations and boards are limiting the scope of the practice of individual physicians. Law now directs specific methods of treatment and prophylaxis for certain diseases. These movements indicate with inevitable certainty the gradual transference of medical ethics to legal statutes.

We have at present only 26 states which have enacted laws that are in good legal standing on the subject of sterilization. Sterilization in these states is being approved largely for eugenic reasons in the feeble-minded, insane, and those with inheritable defective diseases. In many of such institutions the type of operation to be performed is specified. If not so performed, the physician is liable for homicide if death occurs, or for mayhem.

It must be emphasized that each state develops its own interpretations of its laws, and that the legal phraseology may produce unexpected complications. It then behooves us to bring out clearly and definitely therapeutic and medical reasons for medical and surgical procedures so that they will be strong enough to hold up under legal onslaught.

Sterilizations or abortions, should always be protected by consultation, with a physician of unquestionable merit and his opinion should be given in writing. I think the essayist has presented a method of approach to the solution of this problem by the appointment of an anonymous medical committee of outstanding men in the divisions of medicine, obstetrics, gynecology, and surgery of the hospital to guard the interests of the patient, the physician, and the hospital.

We should read and learn the rules and regulations presented by Dr. Pearse and his hospital committee. This committee has done splendid work, but it must be patient in the prolonged period of education that is required to bring up to the desired levels the necessary cooperation of the group as a whole.

DR. RUDOLPH W. HOLMES, Chicago, Ill.—I shall discuss only the second topic of the paper—therapeutic abortion control. I fear many may not have grasped the full significance of their contribution. To my knowwledge it is the first concerted attempt to control therapeutic abortions by a hospital. Over forty-five years ago it was my privilege to be the Chairman of the Committee on Criminal Abortion of the Chicago Medical Society; our Committee was intimately associated as consultants with the State's Attorney and Coroner on practically all matters pertaining to the deaths of women with actual or putative criminal operations.

The line of demarcation between a valid therapeutic intervention and an actual criminal procedure may be so tenuous that it is not existent. The shady practitioner who still attempts to retain his professional reputation always asserts, and will defend his position if he appears in a court of law, that the operation was performed to save life, or, as is permitted in some states, to conserve health. He generally has a confederate (a consultant) to abet him: if conviction ensues, the consultant is an accessory before the fact, and may be subjected to the same penalty as his principal. It is indubitably true that such allegations thwart justice more than any other single defense. It is likewise a truism that such defendants will call in presumably reputable physicians who will testify as to fact, or qualify themselves as "experts," and give testimony which is tantamount to perjury.

It behooves medical staffs of all reputable hospitals to institute regulations comparable to those employed in the Crittenton Hospital. It would be a great protection to the operator as well as a deterrent to dangerous aspersions by outsiders.

DR. G. K. FOLGER, Cleveland, Ohio.—Three years ago we had somewhat the same problem in the University Hospitals in Cleveland, concerning postpartum sterilization. In Ohio, therapeutic abortion may be done for reasons affecting the life of the mother. Our biggest problem has been those cases done for psychiatric indications, many times,

questionable psychiatric reasons, involving members of the medical staff's families. Our big problem has been postpartum sterilization, which has become a rather serious matter. We investigated the controls in many hospitals throughout the country, and found that, by and large, they had no control. The question resolves itself in many cases to the opinion of the chief of the service. Feeling that we should have some control on postpartum or any sterilization, in cases where the abdomen is opened for the purpose of sterilizing, we require two consultations; one from the department for which the sterilization is thought to be necessary, the other appointed by the administration to concur in this matter. It has made a tremendous difference in the number of sterilizations. However, when only the medical considerations are given to this problem, I think we leave out one of the factors that has to be considered. I refer to the economic and social status of certain patients. We, as physicians, are a little bit remiss in not giving more consideration to the social and/or economic status of certain patients, particularly where there is already a large family. I think that this side of the picture should be more frequently considered.

DR. BRUNELL FARRIS, Oklahoma City, Okla.—I should like to ask if such consultation is necessary for sterilization operations, why is it not also necessary for a hysterectomy?

DR. PEARSE (Closing).—Since I am the Head of the Department in this hospital, I am the individual referred to who not only got the appeals, but also the censure. Whenever you head any organization, you must understand, when taking the position, that you are going to be criticized. You must be absolutely honest in your decisions and not influenced by your friends, kindly or otherwise.

With regard to having a psychiatrist on the permanent committee, we only call for psychiatric consultation when the case has a psychiatric background as the basis for sterilization. Dr. Farris asks the question, "Why not a committee to control hysterectomies?" In a large hospital such a committee would have a tremenodus job. However, one can easily see that this might curtail many unjustified hysterectomies that are now done. I might also add that a hysterectomy is occasionally done to procure sterilization and also to circumvent the rules and regulations regarding the same.

Due to the shortage of reading time we removed the moral aspect of the question from our paper. When referring to the moral aspects one naturally thinks of the Catholic Church; however, there are some Protestant denominations which forbid their members practicing contraception or having sterilization operations performed upon themselves. My information on this aspect of the question was obtained from several eminent Catholic theologians and is here briefly stated. It is classified under the law of double effect. The question is, "Can you perform an act from which two effects will follow, a good effect and an evil effect?" The answer is "Yes," provided you fulfill the following four conditions:

1. The act performed must be a good act or at least an indifferent act. Hence, murder, which is intrinsically evil would be ruled out by this first condition.

2. The evil effect, although foreseen, is not intended but only permitted. For example, a cancerous uterus containing a nonviable fetus may be removed. The good effect is the wish to cure the woman of her carcinoma. The evil effect which is the destruction of the living fetus is foreseen and permitted. The fetus in this case dies of natural causes following the operative procedures.

3. An evil act cannot be performed to produce a good effect. For example, you would not be permitted to kill a living fetus, the evil effect, to improve the health of the mother, the good effect.

4. The good effect procured must be proportionate to the evil suffered. For example, a country that was legally entitled to a small piece of real estate would not be permitted to go to war, thereby causing a great amount of evil through suffering and loss of life, simply to obtain this small acreage to which they were legally entitled.

The authors of this paper are both Protestants and it is not our intent to argue the moral grounds, but simply to state them as they are held by theologians of these particular faiths.

With regard to the legal aspects, the statutes of different states which have a law are varied and interesting. I would like to thank the Attorneys General of the several states for their voluminous letters explaining the laws in their states as well as giving us many references. We were surprised at the extreme interest shown in this topic by the legal profession. It might interest you to know that there are four or five states in this nation which have laws on their statute books forbidding the Attorney General giving out the information we requested. Oklahoma is one of these states. In each state of this type, the Attorney General felt the subject was so important that he gave us an analysis of the law and his unofficial opinion. Having studied this problem carefully, I feel certain that many of the statutes on the books at the present time are unconstitutional, based on the case of Buck vs. Bell in the State of Virginia. This case was held no cause for action and the law of Virginia declared constitutional by the Supreme Court of the United States. My opinion would be that in order for a law to be constitutional it would have to comply with the following three requirements:

1. The statute, in order not to be classified as class legislation, must apply to every individual legally resident within the state in that particular category. For example, the law cannot apply to epileptics resident within state institutions, but must apply to all epileptics in the state.

2. The statute must provide for due process of law. That means that the individual to be sterilized, a parent in case of a minor, or the guardian in case of an incompetent, must have the privilege of petitioning for a trial, be able to call witnesses, and, after a decision has been rendered, appeal to a higher court.

3. The operation specified to procure the sterilization must not be "cruel and unusual." The Supreme Court has held that operations upon the Fallopian tubes are not cruel and unusual where castration to procure sterilization would be.

CLINICAL EVALUATION OF X-RAY PELVIMETRY*

A Study of 1,000 Patients in Private Practice

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ONE great challenge every obstetrician faces daily is that of delivering normal, unharmed infants of mothers who themselves remain normal and unharmed by the procedure. Often making difficult this challenge are unknown quantities which offer degrees of impediment, complicating an otherwise normal process. The most common of these are concerned with fetopelvic relationships. It is in this respect that the use of the x-ray as an aid has become a most valuable adjunct to present-day obstetrics.

To depend on this aid, one prime requisite is to have a roentgenologist who not only can perform the technical function of obtaining evidence and mensuration, but also one who is interested in its meticulous application.

Weinberg and Scadron[1] measured 100 patients by each of four accepted methods and found results within 0.1 cm. of each other. These and repeated investigations reported in the literature would lead us to believe that the method used is less important than experience in using the method.

Another necessary requisite for utilizing an x-ray report is to have some established norms from which one can draw conclusions as to expected patient behavior in labor and the safest method of delivery.

This study is designed to establish various norms and to answer the following questions: (1) To what extent can an x-ray appraisal of pelvic capacity be depended upon? (2) What modifications can one expect in interpretation, providing all the *known* variants in labor are considered? (3) Can reliance be placed on estimation of fetal skull capacity in utero? (4) What are the limitations to be anticipated in cephalopelvic disproportions in normal and in contracted pelves?

Case Material and Procedures

One thousand patient records were collected from the group practice of Drs. E. L. King, John S. Herring, John A. King, and the author. All were white private patients delivered under ideal hospital conditions. Delivery techniques, therefore, were consistent in thought and procedure. There was no selection other than that of the roentgenologist and completion of report and record. To obtain 1,000 such records, approximately 5,000 records were surveyed. The majority of patients were delivered since 1944.

*Presented at the Seventeenth Annual Meeting of the Central Association of Obstetricians and Gynecologists, Oklahoma City, Okla., Nov. 3 to 5, 1949.

The Johnson stereoscopic method was employed in 880 instances and the Snow technique in 120. In all fetal skull studies the Ball method was used. One roentgenologist reported the 880 and two reported the 120. On a number of occasions, when clinical findings disagreed with the x-ray findings, one method was tested by the other. The variation has been consistently insignificant clinically. Subsequent re-examination of the same patient in the same or later pregnancies has likewise shown little or no variation of x-ray report.

Roentgenograms were indicated in primigravidas under the following conditions:

1. Suspect pelves on office evaluation.
2. Suspicion of an unusually large baby, unusual position or presentation.
3. Nonengagement of the fetal head at 38 weeks.
4. Postmaturity.

Since 1946 almost routinely all primigravidas have been evaluated in this fashion.

In the multipara the indications were:

1. A history of loss of previous baby or babies.
2. A history of previous difficult labor.
3. Suspect pelves in which previous baby has been small or premature.
4. Suspicion of an unusually large baby, unusual position, or presentation.

The optimum period for obtaining this information is within two weeks of term. The great advantage of selecting this period is that of determining the size of the fetal skull at its near-maximum growth. In our experience, the average fetal skull will increase approximately 25 c.c. in volume per week at or near term, depending on the presence or absence of prepartum molding. This factor should always be taken into consideration.

Torpin and Algood[2] have recently shown the accuracy of fetal skull measurement in utero. In 482 cases, 321 were found to be within 0.5 cm. of actual size and within 1 cm. of true size in 427 cases (88.7 per cent). We have been encouraged by an equal accuracy in measuring the skull after delivery, particularly following cesarean section. The number recorded was not large enough to include in this study.

The normal values in this study were accepted as:

	CM.
Inlet.—	
Anteroposterior	11.5
Transverse	13.0
Posterior sagittal	4.7
Midplane.—	
Anteroposterior	11.5
Transverse	10.5
Posterior sagittal	4.4
Outlet.—	
Anteroposterior	11.5
Transverse	11.0
Posterior sagittal	7.5

Statistical Study

There were 850 primigravidas and 150 multiparas. In these 1,000 cases, there were 937 vertex presentations, 48 breech, 11 brow, 3 transverse, and 1 face presentation (Table I).

TABLE I. PRESENTATION

	NO.	VERTEX	BREECH	FACE	BROW	TRANSVERSE
Primigravidas	850	796	44	0	9	1
Multiparas	150	141	4	1	2	2
Total	1,000	937	48	1	11	3

There were 32 inlet contractions, (anteroposterior less than 10.5 cm.), 197 midplane contractions, (transverse or bi-ischial less than 10.0 cm.), and 17 outlet contractions, (transverse less than 10.0 cm. and/or anteroposterior less than 10.5 cm.). All outlet contractions were noted in conjunction with midplane variation. No outlet contraction was found to exist alone. Inlet anteroposterior narrowing less than 10.5 cm. was noted alone in 21 instances and 11 times in combination with contractions of the midplane (Table II).

TABLE II. CONTRACTED PELVES

	INLET	MIDPLANE	OUTLET	OUTLET ALONE
Contraction	32	197	17	0
In combination	11	28	17	0

It was interesting to note that whereas all marked discrepancies at the inlet and midplane were detected clinically, 61, or 31 per cent, borderline midplane bi-ischial contractions were unrecognized. Steele and Javert[3] in their study found 300 contracted pelves of which 50 per cent were recognized clinically. This emphasizes the consistent inadequacy of accurate clinical evaluation of *all* midplane diameters. In outlet measurements the clinical findings were usually within 0.2 to 0.4 cm. of the x-ray findings.

Evaluation of Pelvis Contraction

Inlet Contraction.—

Of the 32 inlet contractions, 11 were of enough magnitude to require delivery by cesarean section. These included one breech and one brow in primigravidas. In the remaining 9, the presenting part failed to enter the pelvis.

Recognized inlet contraction and/or cephalopelvic disproportion at the inlet in vertex presentations presented no great problem. If they were serious, elective section was performed. If borderline, a sufficient trial of labor influenced decision. If combined with midplane contracture, the prognosis for vaginal delivery was considered grave. There were no instances of prolapse of the cord in patients so managed.

Midplane Evaluation.—

Clinically, the pelvic midplane presented the real obstetrical problem. The difficulty of its accurate numerical clinical appraisal is certainly appreciated by every obstetrician. Various formulas have been suggested to establish a dividing line between adequacy and contraction.

In studying the bi-ischial diameter alone, 197 patients were found to have bi-ischial midplane diameters of less than 10.0 cm. Of these, 88 revealed bi-ischial diameters of 9.5 cm. or less. This incidence of 8.8 per cent is considerably less than in Hanson's[4] study wherein 16.1 per cent of 1,120 patients were found to measure 9.5 cm. in the transverse of the midplane, determined by clinical pelvimetry.

In 197 instances of bi-ischial midplane contractions of less than 10.0 cm., 60, or 30.4 per cent, required cesarean section (Fig. 1). When this diameter measured less than 9.4 cm. there was a very sudden rise in cesarean section rate. In spite of the presence of this contraction and deviation from normal, 7 pa-

tients with bi-ischial diameters of 9.4 cm., 5 with 9.3 cm., 3 with 9.2 cm., one each with 9.0 cm., 8.9 cm., and 8.3 cm. were delivered vaginally, uneventfully.

Observation of this type of behavior in the past, in the face of known pelvic inadequacy, no doubt led to the suspicion that the midplane, like the outlet, could be compensated transversely by the anteroposterior diameter in whole or part. In 1948, Mengert[5] suggested an approach to recognition of this com-

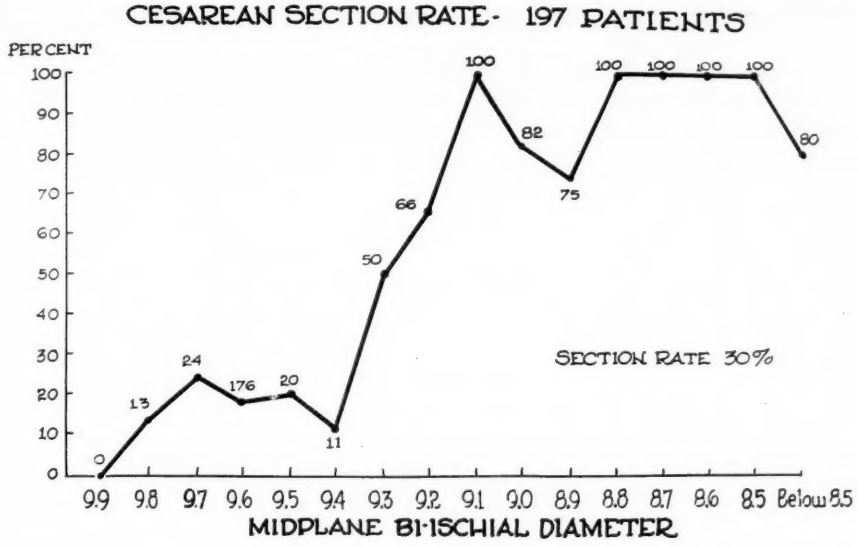

Fig. 1.

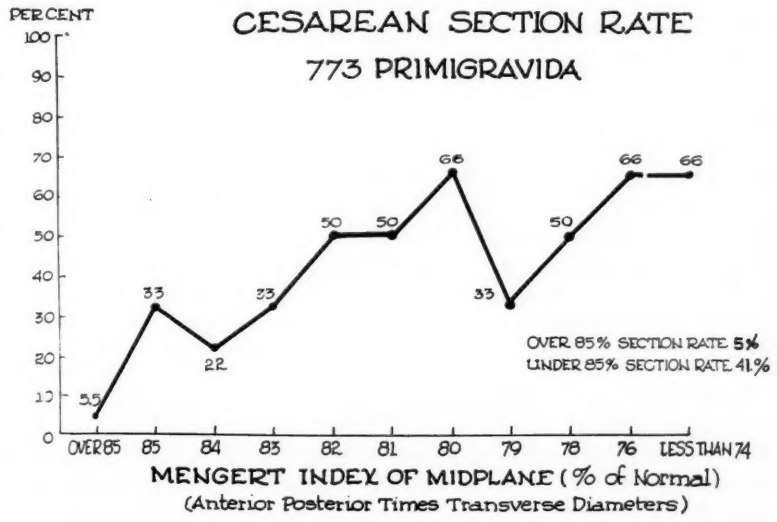

Fig. 2.

pensatory feature. He devised an index, obtained by multiplying the anteroposterior diameter by the transverse diameter in the midplane and expressing the index in percentage of normal. With an established normal product of 125, he found that "By a process of trial and error, it became obvious that 85 per cent of normal capacity represented the borderline between adequacy and contraction."

Seven hundred seventy-three primigravidas were studied in relationship to this index as far as midplane capacity was concerned. In this group there were no inlet contractions. Ten per cent of 773 patients were found to have an index of 85 or less. When this index exceeded 85, the cesarean section rate was 5.5 per cent and wherein it was found to be below 85 the section rate increased to 41 per cent. Fig. 2 depicts the distribution of necessary cesarean section. Although this index over 85 represents an adequate pelvis in most instances, an index under 85 did not exclude safe vaginal delivery in 37 instances (Table III).

TABLE III. MENGERT INDEX
VAGINAL DELIVERIES WHEN INDEX WAS FOUND TO BE 84 OR BELOW

INDEX	NO.
84	6
83	12
82	5
81	1
80	2
79	7
78	1
76	1
Less than 74	2
Total	37

Another approach to determine midplane capacity was devised by Weinberg and Scadron.[1] These investigators found that, in a series of 500 cases, dystocia could be expected if the addition of the midplane transverse and posterior sagittal diameters was less than 14 cm. In this series of 718 patients so studied, when the index exceeded 14.0 cm., the cesarean section rate was 3 per cent. When it was found to be 14.0 cm. or less, the rate increased to 21 per cent. When the index was found to be less than 14.0 cm. the section rate was 23.4 per cent. However, nine patients were safely delivered vaginally (one admittedly difficult), with an index of less than 13.0 cm. Vaginal delivery occurred less frequently in the whole group when the index was found to be less than 13.3 cm. (Fig. 3).

To this point, discussion has been confined to the consideration of the bony pelvis for the most part. To those who would question the slight variation in comparison of the x-ray measurements to the dry pelvis, the number of cases analyzed should absorb the variation equally. The trends indicated that dystocia to a point of excluding safe vaginal delivery was present in the majority of patients, whenever the midplane was found to be contracted transversely, less than 9.4 cm.; in combination with the anteroposterior, less than 84 per cent of normal; and in combination with the posterior sagittal, less than 13.3 cm.

Size of Fetal Head.—

It would appear, then, that the other necessary factor to consider in the explanation of variations so far studied would be the size of the fetal head. Certainly, where babies were successfully delivered through midplanes whose transverse diameters were less than 9.2 cm., or pelves in which either midplane index was unusually low, those babies either were unusually small or had small skull circumferences and volumes. Generally these were aided by the absence of position dystocia and the presence of good mechanisms.

The patients in this series were managed by relying on the x-ray evaluation of fetal head circumference and volume, the known pelvic diameters, pelvic capacity and volume, and knowledge of general pelvic architecture. This was combined with the clinical appraisal on admission and at term. An over-all

study was made on 710 primigravidas with emphasis on the cephalopelvic relationship alone (Fig. 4). The cesarean section rate followed a rather well-ordered pattern. When a cephalopelvic disproportion of –200 c.c. or less existed the rate was 5.1 per cent. When the disproportion exceeded –200 c.c. the rate suddenly increased to 87 per cent.

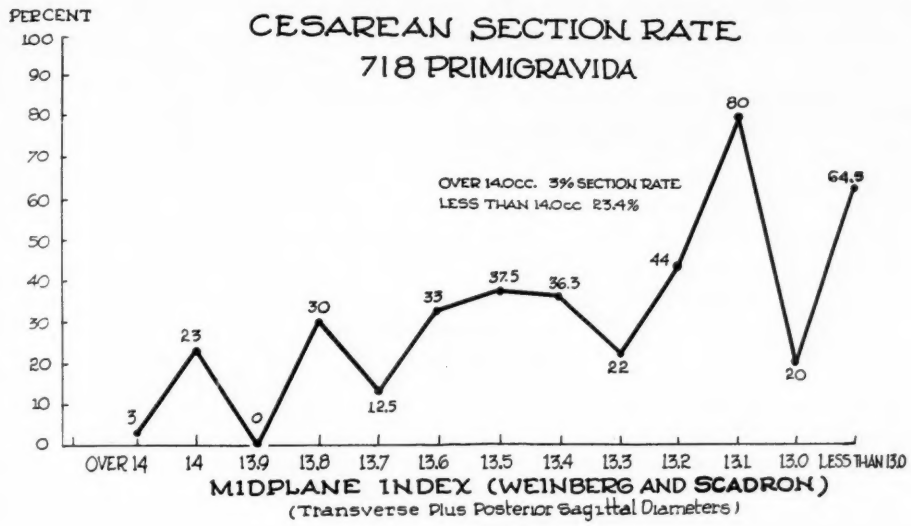

Fig. 3.

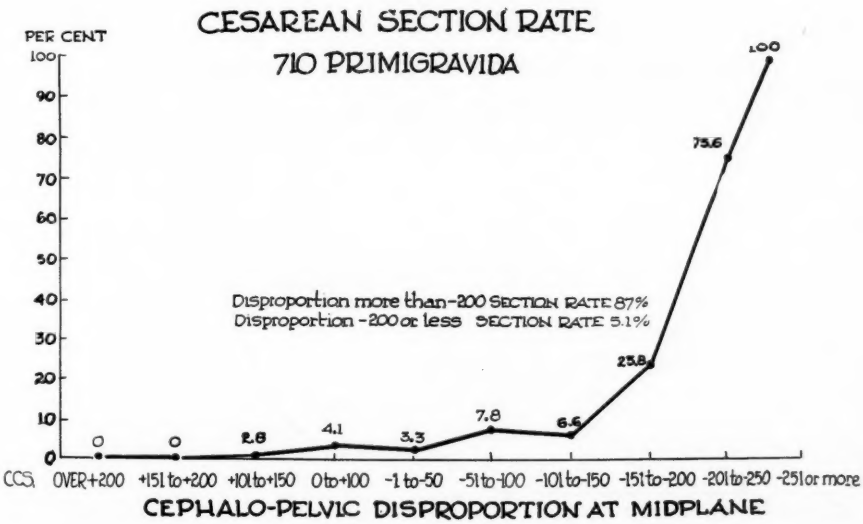

Fig. 4.

In order to eliminate doubt as to the influence on judgment and procedure occasioned by the known presence of disproportion, 690 primigravidas were studied in categories of those with normal and those with contracted pelves. In this group (as was done in studying the two indices), it seemed correct to delete 20 cases. Nine of these were cesarean sections which were performed for indications other than disproportion (toxemia uncontrolled 2, brow presenta-

tions 5, cervical dystocia 1, age plus degenerative fibroids 1). Eleven breech presentations were eliminated because of the questionable difficulty of obtaining accurate fetal skull evaluation in this presentation.

In 503 normal pelves, no difficulty was experienced until the reported midplane disproportion exceeded –200 c.c. (Fig. 5). At this point there was a marked increase in the necessary section rate. Below disproportions of –201 c.c. the rate was 0.6 per cent, above –201 c.c. the rate increased to 75 per cent. A normal pelvis tolerated great discrepancies between fetal head and the pelvis.

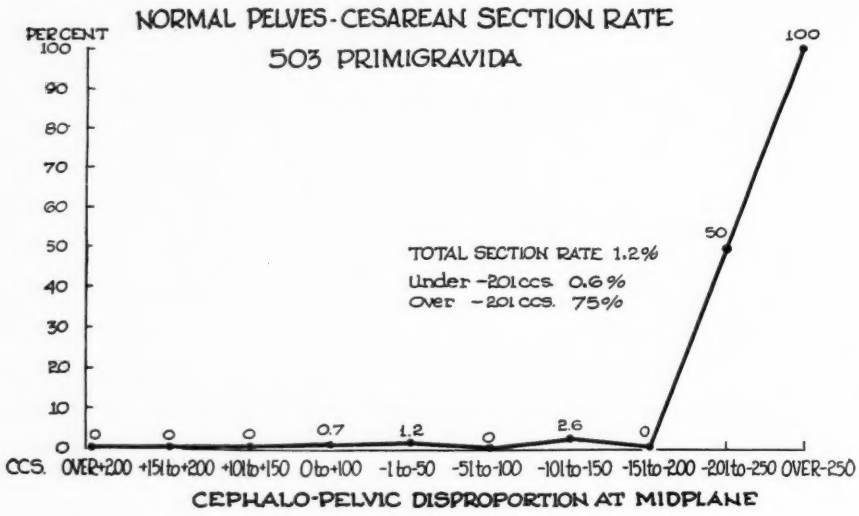

Fig. 5.

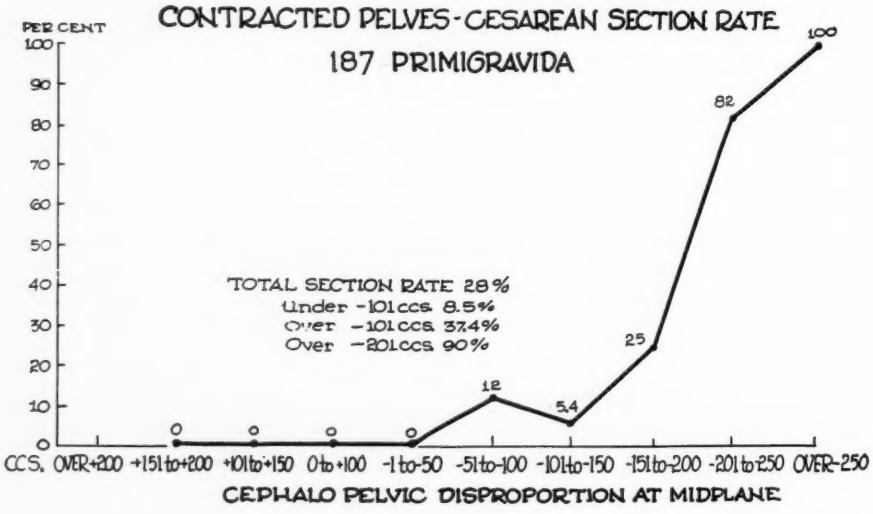

Fig. 6.

Troublesome dystocia in vaginal operative intervention or necessary abdominal delivery resulted only whenever the disproportion exceeded –201 c.c. The overall section rate in normal pelves was 1.2 per cent.

In 187 patients with contracted midplanes (classified by contractions in the bi-ischial diameter of less than 10.0 cm., and in many instances an accompanying decrease in one or both midplane indices described), the amount of cephalopelvic

disproportion tolerated was much less (Fig. 6). No difficulty was encountered as long as the relationship was less than –51 c.c. A 12 per cent cesarean section rate resulted when the disproportion reached –51 to –100 c.c. A more sudden rise was evident when the disproportion reached –151 c.c. (25 per cent). The incidence of cesarean section was increased remarkably (90 per cent) whenever cephalopelvic disproportions reached –201 c.c. or more. In the presence of known pelvic contraction, there was a well-ordered curve of necessary operative procedure.

The comparison between cephalopelvic disproportion in normal and contracted pelves is shown in Table IV.

It is generally agreed that it is not possible to predict beforehand the exact amount of molding a given fetal head will allow. However, the last two groups studied would tend to show that a large fetal head will compensate disproportion to a greater amount than a smaller fetal head. For example, a discrepancy representing a fetal head volume of 850 c.c. has been observed to pass through a midplane with a volume of 650 c.c. or, in other words, mold a total of 200 c.c. In this instance the fetal head would mold approximately 23.5 per cent. It would be erroneous to expect a fetal head of 500 c.c. to mold 200 c.c. (40 per cent) to pass a midplane with a volume of 300 c.c. This would explain why disproportion in the normal group, which was due to the size of the fetal head, was better tolerated than equal or 100 c.c. less disproportion in a contracted pelvis where the cephalopelvic disproportion was due chiefly to pelvic contraction. A combination of a large fetal head and a major pelvic contraction offered the poorest prognosis for vaginal delivery.

The use of x-ray evaluation of the fetopelvic relationship has been of tremendous help in planning delivery of the multipara, often referred because of previous difficulty. Since the majority of multiparas are not x-rayed, unless in unusual circumstances, this group was purposely omitted from the analyses in Figs. 2, 3, 4, 5, and 6. It was felt that their high rate of abnormality would affect the over-all appraisal.

There were 150 multiparas in the series. One hundred twenty-five had one previous delivery, 18 two deliveries, and 7 three deliveries. The most important factors in their past histories were as follows:

Difficult labors	44
Spastic children	4
Loss of one baby	26
Loss of two consecutive babies	4
Previous premature	4
Previous small baby	10
Previous craniotomy	2
Fractured pelvis	1
Suspect pelvis	29
Previous cesarean section	11

On the basis of roentgenological study, 127 were delivered normally. There were 23 cesarean sections, a rate of 15.3 per cent. This included 7 of the patients having had previous cesarean section. Four who had had previous cesarean section were delivered uneventfully from below. This would reduce the total number to 16 first sections or a rate of 10.6 per cent. Indication for section was as follows:

Contracted midplane with major disproportion (including 2 previous craniotomies)	13	
Transverse lie	2	
Brow with disproportion	1	16
Previous classical cesarean section	2	
Previous section. Contracted pelvis	5	7
		23

TABLE IV. CEPHALOPELVIC DISPROPORTION AT THE MIDPLANE. COMPARISON IN NORMAL AND CONTRACTED PELVES

DISPROPORTION	CESAREAN SECTION NORMAL PELVIS (PER CENT)	CESAREAN SECTION CONTRACTED PELVIS (PER CENT)
Over +200 c.c.	.0	—
+151 to +200 c.c.	.0	.0
+101 to +150 c.c.	.0	.0
0 to +100 c.c.	0.7	.0
-1 to -50 c.c.	1.2	.0
-51 to -100 c.c.	.0	12.0 (critical level)
-101 to -150 c.c.	2.6	5.4
-151 to -200 c.c.	.0	25.0
-201 to -250 c.c.	50.0 (critical level)	82.0
Over -250 c.c.	100.0	100.0

Breech Presentation

The problem of management of breech presentation is still one of great concern. The information available to predict a safe method of delivery is not as exact as that available in vertex presentations. In breech presentations, fetal skull circumference and volume have not been accurate in most instances due to the technical difficulty involved in obtaining proper perspective. Pelvic measurements must be relied upon alone. Molding does not occur and therefore fetopelvic disproportions are not compensated for in labor. In these presentations reliance on the index of pelvic capacity and estimated size of the fetus clinically was the method of determining delivery procedure. There were 48 breech presentations. Of these, 44 were in primigravidas and 4 in multiparas. There were 42 frank breeches and 6 footlings. In this group there were 13 contracted pelves in primigravidas and 3 elderly primigravidas (past age 37 years), 2 of whom presented contracted pelves.

The deliveries were as follows:

Vaginal Delivery.—		
Primigravidas	35	
Multiparas	4	39
Cesarean Section.—		
Primigravidas with contracted pelvis	6	
Elderly primigravidas	3	9
Cesarean section rate	18.7%	

Comment

To rely fully on an x-ray report and to use it without due consideration of the clinical aspects of a given patient would be unscientific and in due time would produce bizarre results. To have the roentgenologist dictate obstetrical procedure is likewise unwise. Too often an accoucheur, unfamiliar with the value, interpretation, and limitation of x-ray evidence, will be influenced into either radicalism or sad conservatism. This is particularly true if, instead of stating the available measurements on the report, the roentgenologist takes the liberty of predicting whether or not he thinks a delivery through the pelvis would be hazardous or difficult. Too often we have found these predictions to be misleading. On the other hand, before one can rely at all on a roentgenological report, there must be some faith created in its value by knowing the consistent technical acuity of its author. Divergence of opinions no doubt are due partly to the accuracy of the report. It is then wise to have the x-ray plates

filed in the office of the obstetrician, so that he may compare them with the patient clinically and use them for constant reference. In instances wherein dystocia is anticipated, these plates can be reviewed while the patient is in labor and a copy of the report should accompany the labor record. Much can be learned by following this procedure.

In the evaluation of a report, the first considerations are the pelvic measurements in each plane, and a note of the amount of deviation from the normal. The next consideration is that of fetal position and size. An accurate knowledge of fetal skull volume is certainly helpful. Inlet disproportions will be evident clinically in vertex presentations. The amount of anteroposterior narrowing can be measured both clinically and roentgenologically. No difficulty was encountered with inlet contraction in this series. Outlet contractions of any note were not found to exist alone. Clinically, outlet diameters can be determined readily.

The exact appraisal of the midplane volume and accurate measurement of its diameters can be achieved only by the use of x-ray. No doubt the transverse diameter is compensated for by the anteroposterior or posterior-sagittal diameter when the first is shorter than normal limits. The critical transverse diameter was shown to be 9.4 cm. With less than this, vaginal delivery was the exception. The index of Mengert is helpful to show anteroposterior compensation. Whenever this index was found to be 84 or below, the rate of safe vaginal delivery became less. By utilizing the posterior-sagittal diameter as a compensatory factor in transverse contraction, a critical index of 13.3 was found.

It would appear logical to admit that the variations in type of delivery (in those instances wherein there was known pelvic contraction and dystocia was anticipated but where vaginal delivery resulted from average effort) were due chiefly to the one factor responsible, namely, the size of the fetus, in particular the fetal head.

With reliance on the accuracy of fetal volume determination in utero, in vertex presentations, it has been our practice to take this into consideration as well as the pelvic architecture. A much finer distinction can be made between anticipated facile or difficult labor progress when the cephalopelvic relationship is known. Molding will occur to a greater degree in normal or large pelves because the baby has to be large to produce disproportion in a normal or large pelvis. Large fetal heads mold up to 200 c.c., which represents a relatively small percentage of their total volume.

In contracted pelves where the disproportion is due to pelvic contraction and a relatively smaller baby, much less molding can be expected. Here a small baby cannot mold a proportionately greater percentage of its total skull volume to overcome 200 c.c. disproportion. Hence it would appear incorrect to establish radical procedure or become secure by taking into consideration the amount of cephalopelvic disproportion alone.

This study suggests a safe index of molding of not greater than 25 per cent of the fetal skull volume.

Appreciation of all factors becomes valuable in the management at delivery. Patients in whom tedious labors were anticipated were sedated lightly and never given saddle-block anesthesia until the presenting part was well past the midplane contraction. The intelligent parturient can be told the facts without undue emphasis and her cooperation enlisted to aid in submitting to a long labor to complete a successful vaginal delivery.

If in addition to dystocia there existed unfavorable fetal positions, poor mechanisms of labor, and the occasional poorly behaved patient, the task of the obstetrician was onerous. Reliance on prepartum knowledge of the fetopelvic relationship and the pelvic architecture, even in these cases, produced consistent success.

Of 1,000 deliveries, there were seven stillbirths and two neonatal deaths. None were attributed to pelvic contraction. Three of the stillbirths were monsters. The over-all fetal mortality was 0.9 per cent (Table V).

TABLE V. FETAL MORTALITY, RATE 0.9 PER CENT

Stillbirths (Rate 0.7 per cent).—
1. Hydrocephalic monster
2. Monster, multiple defects
3. Monster, multiple defects
4. Macerated stillbirth, cause unknown
5. Abruptio, intrapartum death
6. Intrapartum death, cause unknown
7. Prolapse of cord in primigravida breech

Neonatal (Rate 0.2 per cent).—
1. Premature twin, lived 12 hours
2. Cerebral hemorrhage, lived 12 hours

There were no known abnormal or spastic children in subsequent follow-up visits.

There were no instances of version extraction, failed forceps, contraction rings, or uterine rupture. A partial craniotomy done on the one hydrocephalic to release cranial fluid was the only craniotomy.

There was no maternal mortality.

Summary

1. One thousand patients were studied to evaluate x-ray pelvimetry.

2. These were all private patients delivered by an associated group, with procedure thereby standardized.

3. The method of obtaining x-ray mensuration was not as important as the interest and experience of the roentgenologist.

4. The Johnson and Snow methods were used to obtain pelvic data and the Ball method to obtain fetal data. One roentgenologist in 880 cases used the Johnson method and two, in 120 cases, used the Snow method.

5. There were 850 primigravidas and 150 multiparas.

6. Thirty-two inlet, 197 midplane, and 17 outlet contractions were found. Twenty-eight were in combination. No outlet contraction was found to exist alone.

7. Inlet contractions were no problem. Outlet contractions were not found alone. Midplane contractions, the most common, were studied in detail.

8. Midplane bi-ischial diameters of less than 9.4 cm., a Mengert Index of less than 84, and the transverse-posterior sagittal index of less than 13.3 cm. in this series were found to be critical. There were exceptions to all indices.

9. A more consistent curve was found in considering cephalopelvic relationship. When the cephalopelvic disproportion was distinguished in normal and contracted pelves, an even finer dividing line was drawn in the prognosis for safe vaginal delivery.

10. A large fetal head can be expected to mold to a greater amount than a small fetal head. Disproportion in normal pelves is due to the large fetal head, in contracted pelves to the small pelvic diameters. This explains why greater disproportions are tolerated in normal pelves.

11. In normal pelves vaginal delivery was the rule until the cephalopelvic disproportion exceeded –200 c.c. In contracted pelves vaginal delivery was limited if the disproportion exceeded –51 c.c.

12. A successful approach has been to consider the fetal skull volume, the pelvic volumetric capacity, and the clinical appraisal of a given patient.

13. In no instance, other than frank pelvic deformity, should the roentgenologist dictate obstetrical procedure.

14. There was a stillbirth rate of 0.7 per cent which included three monstrosities. The neonatal death rate was 0.2 per cent. Prematurity and a cerebral hemorrhage accounted for the two. In no fetal death was a contracted pelvis responsible. Three of these fetal deaths are considered preventable.

15. There was no maternal mortality.

Conclusions

To answer the questions proposed at the beginning of this essay:

1. It is believed that the x-ray appraisal of pelvic capacity is accurate enough to assist the obstetrician clinically.

2. In interpretation one must take into consideration the period of gestation, the compensatory features of opposite diameters, the growth of the fetal head, and molding expected in normal and abnormal pelves.

3. We believe that reliance can be placed on the estimation of fetal head size in utero in cephalic presentations. This study would indicate that the clinical result shows definite trends in keeping with cephalopelvic relationship.

4. In normal pelves, disproportions are due to large babies. This explains the relatively larger amount of molding that occurs. In abnormal pelves, relatively smaller degrees of cephalopelvic disproportion are difficult to overcome because of the presence of smaller babies and their ability to tolerate relatively smaller amounts of molding. Position dystocia must constantly be considered with the thought ever in mind that all vaginal operative deliveries will also be more difficult when the pelvis presents variations from normal.

5. It is suggested that an index of safe cephalic molding will not be greater than 25 per cent of the estimated fetal head volume capacity.

I am indebted to Dr. E. L. King for his kind assistance and advice, to Dr. John A. King for his help in collecting the original case reports, and to Alice Pope for her stenographic help in the preparation of this paper.

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Discussion

DR. GERALD ROGERS, Oklahoma City, Okla.—I am in complete accord with Dr. Dyer's indications for x-ray studies of the pelvis in both the primigravida and the multipara.

The diameters of the pelvis which can be accurately measured by x-ray are the obstetrical conjugate, the transverse of the brim, the anteroposterior, the transverse, posterior sagittal, and bispinous of the midplane. The pubosacral and subpubic angles can be visualized. The transverse, anteroposterior, and posterior sagittal of the outlet can be accurately measured manually.

Knowledge of these measurements is so important that, unless one has had considerable experience evaluating pelves, he might best have x-ray mensuration of every primigravida, especially if the promontory is easily reached, the ischial spines prominent, or the sacrosciatic angle narrow.

As Dr. Dyer has emphasized, the roentgenologist must be interested and the obstetrician should see and study every film himself. Entire dependence must not be placed on the x-ray picture. Regardless of what the roentgenogram shows, the baby's head is the most important factor in labor. A head may mold and adapt itself in astonishing ways. Experience is still important in estimating a woman's ability to have a baby through the natural passages. The slide rule and view box cannot and must not replace the trial labor.

Both clinical and x-ray methods of estimating fetal size are notoriously unreliable. The work of Torpin, Allgood, and others demonstrates this fact and leaves much to be desired.

Roentgen estimation of pelvic capacity and fetopelvic relationship is of tremendous value, particularly in the multipara referred because of previous obstetric difficulty.

STUDIES RELATED TO THE TREATMENT OF TOXEMIA OF PREGNANCY*

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(From the Department of Obstetrics of The University of Cincinnati and the Cincinnati General Hospital)

THROUGHOUT the past fifty years, veratrum viride has been continuously and successfully employed—although rather empirically—in the treatment of pre-eclampsia and eclampsia at the Cincinnati General Hospital. Today the mortality rate from eclampsia at this institution is among the lowest on record. During the last nineteen years,[1] 196§ successive cases of eclampsia have been treated. Three maternal deaths occurred, a gross mortality rate of 1.5 per cent. Two of these deaths were due to sepsis and occurred some time after the patients had recovered from toxemia. Only one death resulted from eclampsia per se, a corrected mortality rate of 0.5 per cent. Although other measures—magnesium sulfate intramuscularly and 5 per cent glucose in distilled water intravenously—have been concurrently employed, great reliance has been placed on the value of this amazing vasodepressor drug.

With this record as a stimulus (not to mention severe criticism of its use and deletion of veratrum viride from the latest Pharmacopoeia), it became necessary for our Department to justify the employment of this drug in a scientific manner. Thus was initiated a series of studies on the nature of toxemia of pregnancy, a brief summary of which is the purpose of this paper.

Veratrum Viride

Despite extensive pharmacologic studies, the mode of action of veratrum viride remains unknown.[2] Several investigators believe that veratrum acts through a reflex mechanism mediated through the vagus nerve.[2, 3, 4] The depressor action of the drug is not abolished by atropine.[4] The response to epinephrine is unchanged.[5] Postural hypotension does not occur.[6] Other sympathetic vasopressor phenomena are not affected and cardiac output is not decreased.[7]

Clinically, the administration of a standard dose of veratrum, by either the intravenous[8] or the intramuscular route, produces a marked fall in the blood pressure of toxemic patients which persists for one to two hours. This fall may be accompanied by nausea and vomiting, perspiration, bradycardia, and sensation of burning in the epigastrium and around the mouth. These

*Presented at the Seventeenth Annual Meeting of the Central Association of Obstetricians and Gynecologists, Oklahoma City, Okla., Nov. 3 to 5, 1949.

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§Since this report, five additional eclamptic patients have been treated.

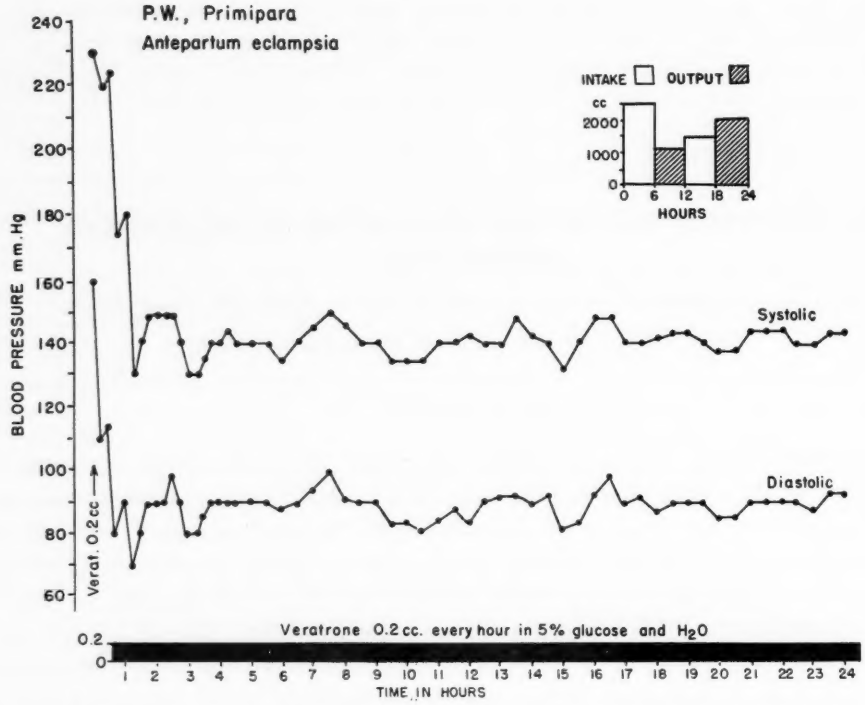

Fig. 1.—Effect of intravenous veratrum on the blood pressure and urine volume of an antepartum eclamptic.

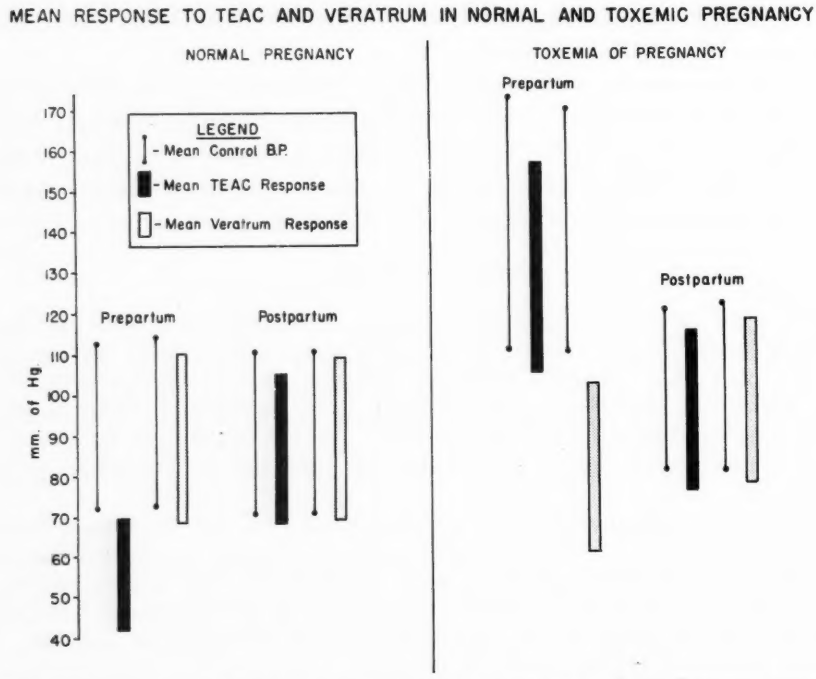

Fig. 2.—Comparison of means. Comparative effect of TEAC and veratrum viride in normal and toxemic pregnancy in the pre- and postpartum periods. Note the marked blood pressure fall in the prepartum test of normal pregnancy with TEAC in contrast with the lack of response to veratrum. The opposite is seen in toxemia. In the postpartum period both responses are similar.

so-called side effects are considered as manifestations inherent in the action of the crude drug.[9] Fig. 1 illustrates the course in an eclamptic patient treated with intravenous administration of veratrum.

We hope that the pure crystalline alkaloids, such as protoveratrine, which is devoid of many untoward side effects,[10] may furnish evidence leading to the site and method of vasodepressor action.

The same standard dose which has been employed in testing toxemic patients is without appreciable effect on the blood pressure of normal full-term pregnant patients, leading us to believe that the hypertension of toxemia is very sensitive to the action of veratrum[9] (Fig. 2).

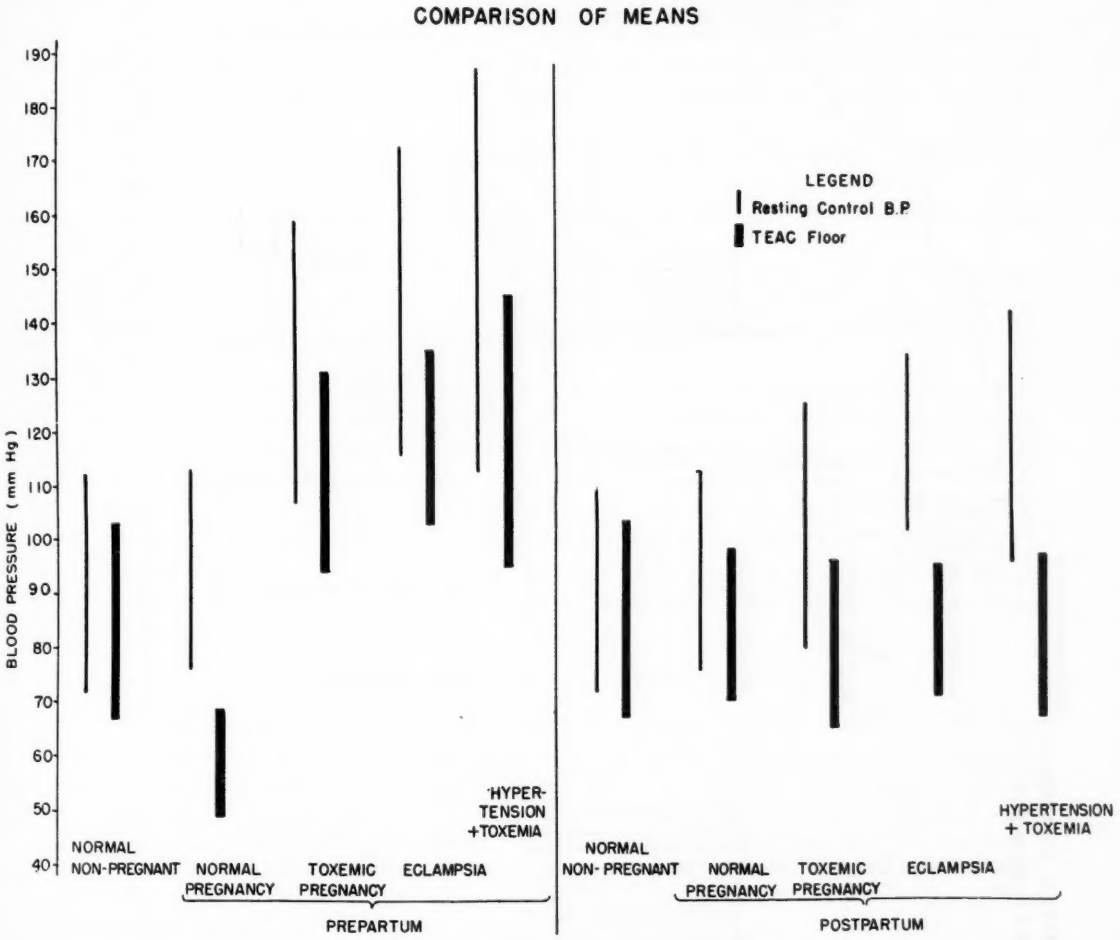

Fig. 3.—Comparison of means of blood pressure control and TEAC "floor." The latter was defined as being the lowest blood pressure reading within five minutes of the injection of the drug. Note the negligible response of toxemic and nonpregnant patients in contrast to the marked response of normal pregnant subjects. In the postpartum period, the response was similar in all of them, though control blood pressure levels were different.

Objection to the use of veratrum has been the effect on urinary output.[11, 12, 13] Recent studies[7, 8, 14] have shown that a transitory decrease in the hourly urine volume is observed in some patients, this decrease being more marked when large doses are given. However, it is compensated by a marked polyuria and it has been proved that this transitory oliguria is harmless for

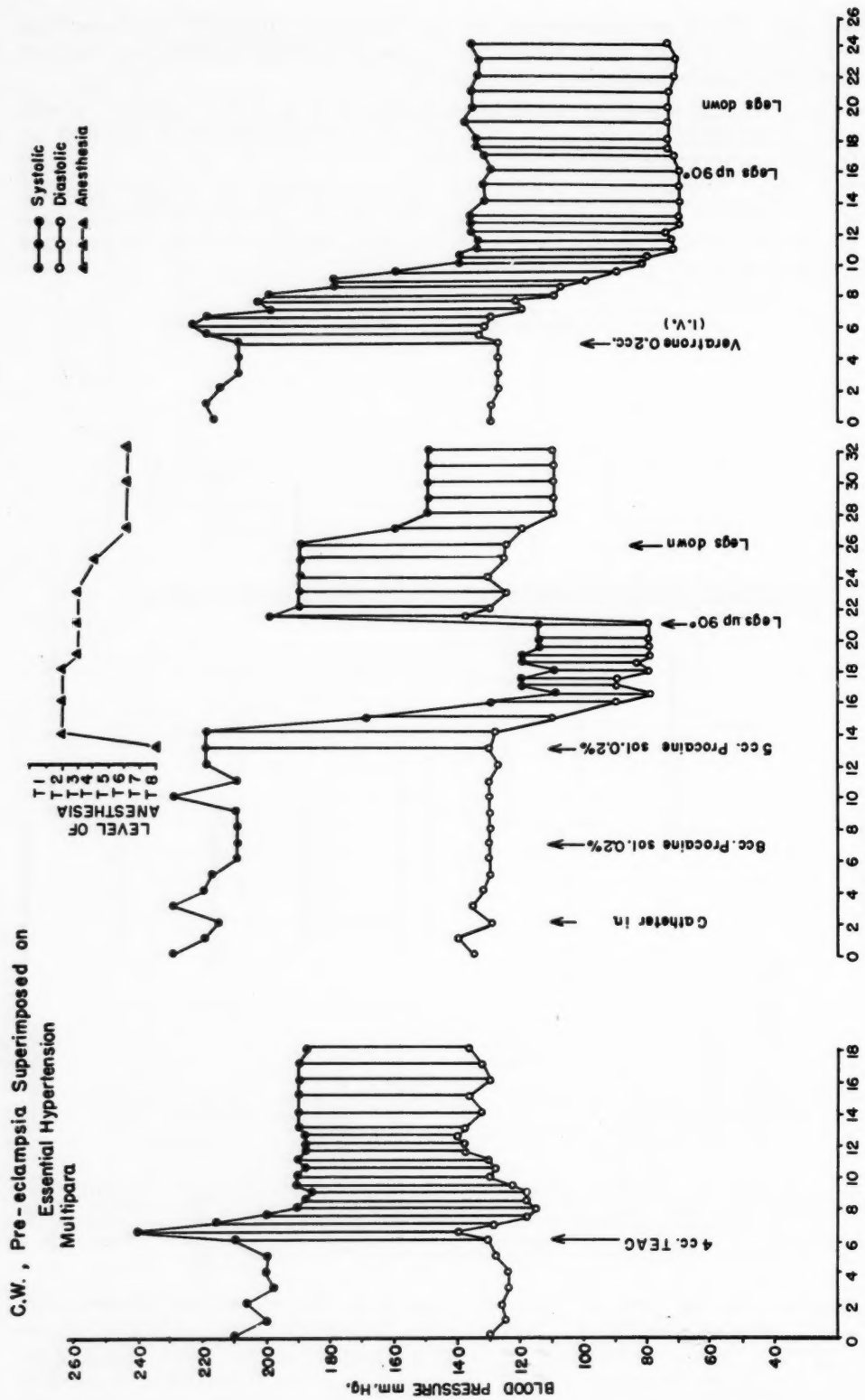

Fig. 4.—Comparative effect of TEAC, high spinal anesthesia, and veratrum in a case of severe pre-eclampsia. (Courtesy of Obstetrical and Gynecological survey.)

the patient. The effect of veratrum on the blood pressure and urine volume of pre-eclamptic and eclamptic patients was fully described in a previous report.[14]

Tetraethylammonium Chloride (TEAC)

Others have undertaken studies of the veratrum alkaloids, particularly Krayer,[2, 3] who, impressed with the clinical application in our institution,[15, 16] became interested in these very powerful pharmacologic agents.[17] While working under him, Acheson and Moe[18] discovered a quartenary ammonium compound, tetraethylammonium chloride, Etamon, or TEAC, which has been demonstrated to have a blocking effect on the autonomic ganglia. By the use of TEAC in man, hypertensive diseases may be segregated into two main groups[19, 20]:

a. Hypertension which responds to the administration of a standard dose of TEAC with a fall to approximately normal levels is believed to be caused primarily by neurogenic impulses transmitted through sympathetic vasoconstrictor fibers.

b. Hypertension which does not fall with TEAC is supposed to be caused by increased humoral factors.

In both types of hypertension an underlying intrinsic factor in the vessel walls is constantly operating.

A study was made in this Department in conjunction with the Department of Medicine on normal nonpregnant women, on normal full-term pregnant patients, and on patients with toxemia of pregnancy, using a standard TEAC test.[21] The results show the following (Fig. 3):

a. A slight fall in the blood pressure of normal nonpregnant women.

b. A marked fall in the blood pressure of normal pregnant patients at term. After delivery the blood pressure response is similar to that observed in nonpregnant women.

c. A negligible fall in the blood pressure of toxemic patients in the prepartum period with a return to normal when the toxemia has subsided.

In a subsequent comparative study, the responses to veratrum and TEAC encountered near term in normal pregnant women and in toxemic women were diametrically opposed[5-22] (Fig. 2).

Selective High Spinal Anesthesia

In order to correlate the effect of sympathetic blockade with TEAC and other sympathetic blocking agents, an experimental study was recently initiated in this Department using high selective spinal anesthesia with 0.2 per cent procaine solution, according to a modified technique of Sarnoff and Arrowood.[23] The details of this technique and its rationale will be reported elsewhere.[24] The results indicate that the effect of sympathetic blockade with high selective spinal anesthesia, in normal term pregnancy and in nonpregnant women, parallels to some extent the effect of TEAC.

In toxemia of pregnancy, the effect of high selective spinal anesthesia is variable. Some patients respond with a fall in blood pressure while others show little change. A degree of venous pooling in the lower extremities is observed in the patients who have a fall in blood pressure. This is evidenced by the return of the blood pressure to original levels when the lower extremities are elevated to 90 degrees (Fig. 4). In toxemic patients who show minimal responses to spinal anesthesia, greater falls in blood pressure are elicited with veratrum.

The mechanism of fall in blood pressure in high spinal anesthesia is not definitely known. Venous pooling and decreased cardiac output are suspected.

In this Department, we are attempting to study the cardiac output and renal function under high spinal anesthesia. The results of this study will be the subject of a further report.

Discussion

Blood pressure is maintained by several factors which include cardiac output, circulating blood volume, viscosity of the blood, elasticity of arteriolar walls, and peripheral resistance. With the latter we are particularly concerned, since we consider,[25] not without support,[26, 27] that abnormal arteriolar vasoconstriction is the most important factor operating in the toxemias of pregnancy. The cause is still undetermined, although many theories have been postulated without conclusive supporting evidence.

Peripheral resistance may, for the purpose of simplification, be considered as due to three factors: (a) an *intrinsic component* consisting of the inherent resistance of the vessel wall; (b) a *neurogenic component* controlled by the autonomic nervous system; and (c) a *humoral component*—humoral for want of a better term—comprising all nonintrinsic and nonneurogenic factors.

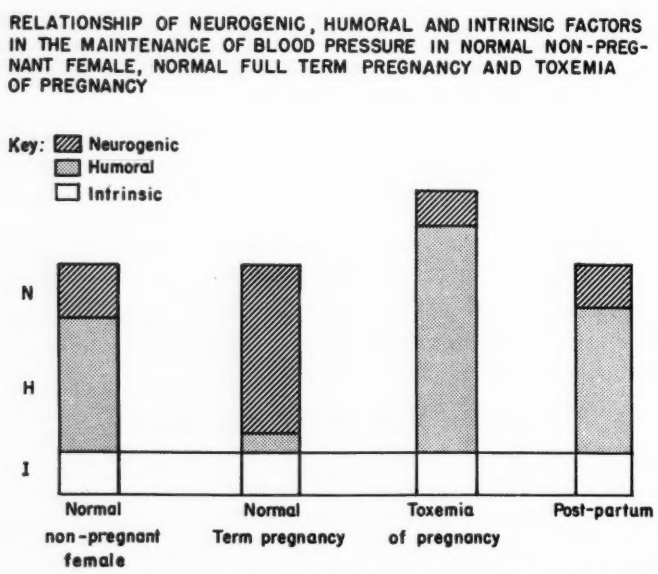

Fig. 5.—Schematic representation of the integrated mechanisms responsible for the blood pressure maintenance as evidenced by the study with autonomic blocking agents.

Actually one cannot possibly, at this time, begin to relate the balanced, integrated responses which result from the interplay and overlapping of these components.

From the evidence previously demonstrated, the following may be postulated (Fig. 5):

a. In the normal adult woman there is a balance between the neurogenic, humoral, and intrinsic components of the vascular peripheral resistance which maintains a rather stable blood pressure.

b. In the normotensive pregnant woman near term, the neurogenic component operates almost to the exclusion of the so-called humoral factor. This

may account for the extremely labile and unstable vasomotor responses at this time. A factor which cannot be ruled out is the effect of venous pooling in the pregnant woman with tremendous venous sinuses present in the uterus, increased intra-abdominal pressure, and increased venous pressure in the lower extremities.

c. In toxemia of pregnancy the humoral factor is greatly exaggerated at the expense of the neurogenic component, as determined by the relative lack of response to sympathetic blockade, with TEAC and high selective spinal anesthesia, as opposed to the response to veratrum which seems almost specific.

These hypotheses are still in the experimental stage and further studies are in progress to substantiate their validity.

Conclusions

1. Blood pressure in normal pregnant women at term is maintained mainly by neurogenic factors. It is very sensitive to TEAC and high selective spinal anesthesia, but is practically unaffected by veratrum.

2. Hypertension in toxemia of pregnancy is maintained mainly by humoral factors. It is not affected by TEAC, but is markedly depressed by veratrum administration. High selective spinal anesthesia produces inconstant results.

3. The available evidence indicates that TEAC is not suitable for the treatment of toxemia of pregnancy. It may be used as a screening test for borderline cases. Veratrum, either intravenously or intramuscularly, is a very effective drug in the treatment of toxemia of pregnancy.

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Discussion

DR. E. G. HOLMSTROM, Salt Lake City, Utah.—Having had no experience with the use of veratrum in the treatment of pregnancy toxemia, I am in no position to comment on this phase of the paper. Certainly, the results which the Cincinnati group have had following the use of this drug are among the best on record. However, it should be pointed out that others have reported equally good results without using veratrum. It is difficult to evaluate the effect of any drug when other measures are used as treatment along with the drug. This has been the chief drawback to an accurate evaluation of veratrum in the treatment of eclampsia. The patients treated with veratrum also received the benefit of such nonspecific measures as bed rest, sedation, etc.—measures which others claim will in themselves produce as good results as veratrum and, at the same time, avoid the undesirable side effects which this drug almost invariably produces. That, I think, is the chief reason why veratrum has failed to achieve a wide popularity The other objection to the drug, namely, its apparently deleterious effect on renal function, is still being debated.

There seems to be no question of the fact that veratrum can lower the blood pressure in hypertensive states. The question is whether the drug can be expected to do more than this when it is used in the treatment of pregnancy toxemia. The authors would like to have us believe that the drug acts specifically against some "humoral factor" present in the blood of toxemia patients, the hypertension being only one manifestation of the presence of this substance However, veratrum also lowers the blood pressure in cases of so-called "essential hypertension" without pregnancy (Freis and Stanton: Am. Heart J. **36**: 723, 1948).

I have no quarrel with the authors regarding the observations presented in their paper However, some exceptions can be taken to the conclusions which they have drawn on the basis of their observations. Although they have apparently shown that in pregnancy toxemia the blood pressure can be lowered by the administration of veratrum while it cannot be lowered with the so-called standard test dose of tetraethylammonium, the fact that this observation does not agree with other recorded observations cannot be overlooked First, as the authors have pointed out in previous papers, the so-called test dose of tetraethylammonium does not completely block the sympathetic impulses to the vasomotor system. Recent studies indicate that, with this dosage, the block is only about 50 per cent complete. Therefore, I would like to ask whether or not they have any evidence that the sympathetic blockade was complete in those cases of pregnancy toxemia which failed to respond with blood pressure drop following administration of tetraethylammonium.

The fact that results following spinal anesthesia have been variable in this regard also raises the question as to whether or not the sympathetic blockade was really complete in those cases in which the blood pressure failed to drop following spinal anesthesia.

Experimental evidence indicates that the vasomotor action of at least one alkaloid of veratrum can be blocked by tetraethylammonium (Moe et al.: Am. J. Physiol. **153**: 601, 1948). If this is true, then one must conclude that at least part of the effect of veratrum must be mediated on the efferent side through the sympathetic ganglia. It seems difficult to reconcile this fact with the results presented here today, namely, that veratrum acts in cases where tetraethylammonium fails to act. It would be interesting to know whether the authors have used veratrum following *complete* sympathetic blockade with tetraethylammonium. I would also like to ask whether veratrum has been given following spinal anesthesia, and if so, whether veratrum then produced an additional drop in the pressure.

I congratulate the authors for "sticking by" veratrum in the face of many statements to the effect that the drug is dangerous, and, as one author states, "enjoying a well-deserved oblivion" Certain purified alkaloids obtained from veratrum may find a respected place in our armamentarium for the study and treatment of various types of hypertensive states. Whether veratrum should be used in cases of pregnancy toxemia is still a debatable question.

DR. J. K. HOERNER, Dayton, Ohio.—This report, so far as I know, represents the lowest mortality of any produced anywhere. Therefore, this method of treatment deserves to be used until a superior method had been developed.

DR. ASSALI (Closing).—In answer to Dr. Holmstrom's questions, I would like to emphasize first that the present study is not concerned with the treatment of toxemia of pregnancy. It is rather a physiologic assay in which the patient received acute intravenous tests in order to evaluate the action of certain drugs and procedures on toxemic hypertension. Only one eclamptic patient in this series was treated with veratrum intravenously for twenty-four hours, and it served to illustrate our recent method.

As to the question of using other medications with veratrum in the treatment of toxemia, we use small amounts of magnesium sulfate and intravenous infusion of 5 per cent glucose in water. We do not restrict fluids and believe with others that low concentration of glucose in water is a good diuretic and is enough to maintain the electrolyte and fluid balance.

The side effects produced by veratrum are considered by us insignificant. In the last series of eclampsia treated with veratrum by intravenous drip these side effects were minimal.

As to the effect of the drug on kidney function. We know very little about the physiology of the kidney. Recent studies have demonstrated that the renal vessels have complete autonomous control. Neither spinal anesthesia nor complete denervation of the renal pedicles has proved of any influence upon the renal blood flow or glomerular filtration. Furthermore, it has been shown that the kidney has a tremendous compensatory power. The transitory decrease in urinary output observed when veratrum is given in large doses is always later compensated by a marked polyuria. It has been attributed by the Boston Group to the stimulation of antidiuretic hormone.

Concerning the question of autonomic blockade with either TEAC or spinal anesthesia, it is not known how extensive the autonomic blockade is with TEAC. There is plenty of evidence, however, that it blocks both sympathetic and parasympathetic systems and is less complete than high paravertebral block. However, in recent studies carried out in our department on the comparative action of spinal anesthesia and TEAC, we have found that, in normal pregnancy, both blocking agents have almost parallel effects.

Dr. Holmstrom asks how we have evidence that this sympathetic blockade is complete. We perform cold pressor tests in the control period and again at the height of spinal anesthesia when the sensory anesthetic level is around C_4 or C_3. The response to the second cold pressor test is invariably abolished. Since the vasopressor reaction to the cold is mediated through pathways which go from T_2 to C_6, we are forced to assume that the blockade is complete to that level. He asked whether we gave any veratrum viride at the height of spinal anesthesia or TEAC. We gave high spinal anesthesia to severely toxemic patients using a low concentration of procaine (0.2 per cent) which blocks the vasoconstrictor fibers without affecting the motor fibers. To our amazement there was no fall in the blood pressure, even with levels up to C_3. Then, at the height of spinal effect, we gave an acute intravenous dose of 0.2 c.c. of veratrum and the blood pressure fell to low levels. We also gave TEAC to patients who have been receiving continuous veratrum administration. The result was a sharp spike in the blood pressure and pulse rate. The details of this study will be the object of a future report.

Finally, let me say that toxemia of pregnancy is still a serious problem which needs solution. More important than arguing about certain types of treatment should be a concerted effort to approach the problem from a physiologic angle. There is no doubt that many factors contribute to the maintenance of blood pressure in health and disease. It is only by understanding these factors and their importance that we can learn something about this disease and can bring some benefit to the pregnant woman.

ENTEROCELE*

An Analysis of 52 Cases

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ENTEROCELE, or, more correctly, posterior vaginal hernia, has been recognized as a clinical entity since 1736 when Garengeot[1] first described it. The true enterocele is a hernia consisting of the layers of the body cavity wall including peritoneum and intra-abdominal contents. Cystoceles and rectoceles are sliding hernias, and are not to be confused with enteroceles. In posterior vaginal hernia, the wall of the body cavity consists merely of vaginal mucosa, its supporting fascia, and peritoneum. A sac of peritoneum dissects beyond its lower normal limits, between the vaginal mucous membrane anteriorly and the rectum posteriorly to emerge through the vaginal introitus. The abdominal opening of such a sac lies between the uterosacral ligaments in close proximity to the posterior aspect of the cervix. Such is the strict definition of enterocele. This implies that the other pelvic organs must be in relatively normal position, that a demonstrable tumor exists, and that a sac be identifiable. However, clinically many cases of prolapse of the uterus, cervical stump, or vaginal vault are, perforce, accompanied by sacs lined by peritoneum, containing abdominal contents, chiefly small bowel, when the pelvic structures are weakened, particularly posteriorly. Although these cases do not fulfill the specific requirements for enterocele per se, they usually are classified as such. Failure to appreciate the significance of enterocele as a component in these cases has led to repeated operations, as will be shown later.

Recent reports[2, 3] on repair of prolapse of the vaginal vault by abdominal procedures prompted the investigation of such cases encountered at the Ochsner Clinic and Charity Hospital in New Orleans. The association of enterocele with such prolapse, in turn, led to the study of all cases of enterocele with or without prolapse of the vaginal vault. A summary of the management of these cases forms the basis of this report.

Analysis of Cases

Thirty-two patients in whom the diagnosis of enterocele was made at the Ochsner Clinic were operated upon between Jan. 1, 1942, and Jan. 1, 1949. During this time 31,663 women were examined at the Ochsner Clinic. Since most women seen at the Ochsner Clinic are examined by gynecologists, the incidence of enterocele in the general female population is reasonably accurate (Table I).

*Presented at the Seventeenth Annual Meeting of the Central Association of Obstetricians and Gynecologists, Oklahoma City, Okla., Nov. 3 to 5, 1949.

TABLE I. ENTEROCELE, 52 CASES

	OCHSNER CLINIC	CHARITY HOSPITAL
With prolapse	14	9
Without prolapse	18	11
Total	32	20
Incidence	1:986	1:1,168

For comparison, the number of patients in whom enterocele, prolapse of the vaginal vault, or procidentia with enterocele was treated at Charity Hospital in New Orleans between Jan. 1, 1941, and Jan. 1, 1948, is shown in Table I. During this period, there were 23,367 admissions to the gynecologic services.

Age.—The age distribution of both groups is remarkably similar, the average age being 56.2 years for the Ochsner Clinic group and 56.5 years for the Charity Hospital group. The ages in the two groups ranged from 37 to 76 years and 36 to 72 years, respectively. This emphasizes the fact that enterocele is a disease of senescence and is properly grouped with procidentia. The patients with enterocele not associated with prolapse averaged only an insignificantly few years younger than the group as a whole.

Parity.—Parity, likewise, was approximately equal in each group, the average number of children being 4.2 in the Ochsner Clinic group and 4.3 in the Charity Hospital group. In three cases of the former, the parity was not recorded and in the latter group, 2 of the women having enterocele in association with prolapse were nulliparous.

Previous Surgical Procedures.—The surgical procedures previously performed on these patients are listed in Table II. The elapsed time prior to correction of enterocele (and prolapse, if present) varied considerably, the shortest interval being six months, the longest thirty-two years. A fact of considerable interest is that extensive plastic procedures, this is, vaginal hysterectomy and the Le Fort operation, were performed on twelve patients in the series five years or less prior to the present operation. It was necessary to reoperate on one patient less than one year after the Le Fort operation, and seven patients who had vaginal hysterectomies were reoperated on within a year and one-half.

TABLE II. PREVIOUS OPERATIONS OF 52 PATIENTS WITH ENTEROCELE

	WITH PROLAPSE			WITHOUT PROLAPSE		
	OCHSNER CLINIC	CHARITY HOSPITAL	TOTAL	OCHSNER CLINIC	CHARITY HOSPITAL	TOTAL
None	7	0	7	4	4	8
Hysterectomy:						
Subtotal	1	4	5	2	0	2
Total	3	1	4	7	0	7
Vaginal	0	4	4	5	7	12
Le Fort	1	0	1	0	0	0
Uterine suspension	2	0	2	0	0	0
	14	9	23	18	11	29

Symptoms.—All patients had similar complaints referable to the genital organs. If prolapse of the uterus, cervical stump, or vaginal vault was prominent, the usual symptoms of these conditions, that is, a "bearing down or dragging sensation," a sense of pressure in the vagina, "organs falling out," or protrusion at the introitus, were noted. Urinary frequency, urgency, and incontinence varied with the degree of cystocele but was often an inconsequential complaint. Discharge and vaginal bleeding, likewise, were rare complaints. Decubitus ulcers were occasionally noted. In striking contrast, the chief symptoms of patients with enterocele alone were referable to the rectum. These patients complained of fullness in the rectum, inability to defecate, fecal impaction, and

a feeling of incomplete emptying of the bowel. Symptoms referable to the bladder, on the other hand, were minimal or of secondary importance. Backache was somewhat more pronounced in these women but was also a complaint of importance in those in whom prolapse was a prominent feature.

Physical Status.—The physical status of these patients was what would be anticipated in this age group (Table III). About half had heart disease, varying in degree from mild to severe. Cardiac failure was not present in any patient and it did not complicate the surgical management. Over half of the patients were obese. Only four patients had other fascial defects such as umbilical, inguinal, or incisional hernias.

TABLE III. PHYSICAL STATUS OF 52 PATIENTS WITH ENTEROCELE

	OCHSNER CLINIC	CHARITY HOSPITAL	TOTAL
Cardiovascular disease:			
Hypertensive	10	12	22
Other	2	0	2
Diabetes mellitus	3	1	4
Obesity	19	7	26
Asthma	0	1	1
Schizophrenia	0	1	1
Other hernias	2	2	4

Surgical Management.—The surgical management of these patients is shown in Table IV. It will be noted that the vaginal approach was employed in all cases. There were no hospital deaths in either group. Morbidity, based on a temperature of 101° F. for any one day or 100.4° F. for two or more days postoperatively including the day of operation, was 20.7 per cent. The chief cause of morbidity was urinary infection.

TABLE IV. OPERATIVE MANAGEMENT

	OCHSNER CLINIC	CHARITY HOSPITAL
Without vaginal prolapse.—		
Excision of sac and repair	10	9*
Interposition operation with excision of sac and repair	3	0
Vaginal excision of sac and repair, abdominal hysterectomy	1	0
Inadequate plastic repair, recurrence		2
With prolapse of uterus, cervical stump, or vaginal vault.—		
Vaginal plastic, with excision of sac	8	2
Vaginal plastic, sac not excised (obliterated)	2	1
Vaginal hysterectomy with excision of sac	4	0
Removal of cervical stump and excision of sac	3	0
Colpectomy with obliteration of sac	1	2
Le Fort procedure	0	4
	32	20

*One subsequently repaired satisfactorily, after failure.

Comment

It is our belief that enterocele is a condition of aging, as indicated by the average age of 56 years in our series. Unquestionably, congenital defects, as emphasized by Meigs,[4] are important factors in the development of these hernias. However, the trauma of childbearing, the effects of the erect position, and the development of fascial weakness accompanying the aging process undoubtedly serve to weaken such a congenital defect so that it finally becomes symptomatic. The question of true enterocele versus deep cul-de-sac need not be discussed here, since both produce the same symptoms and require similar treatment. Enterocele is a disease of the erect position, as are inguinal hernias and hemorrhoids.

The diagnosis of enterocele is, at times, difficult to make. Careful examination of the posterior vaginal wall, by the rectovaginal approach, with the patient straining or coughing, is necessary.[5] Occasionally, the patient should be exam-

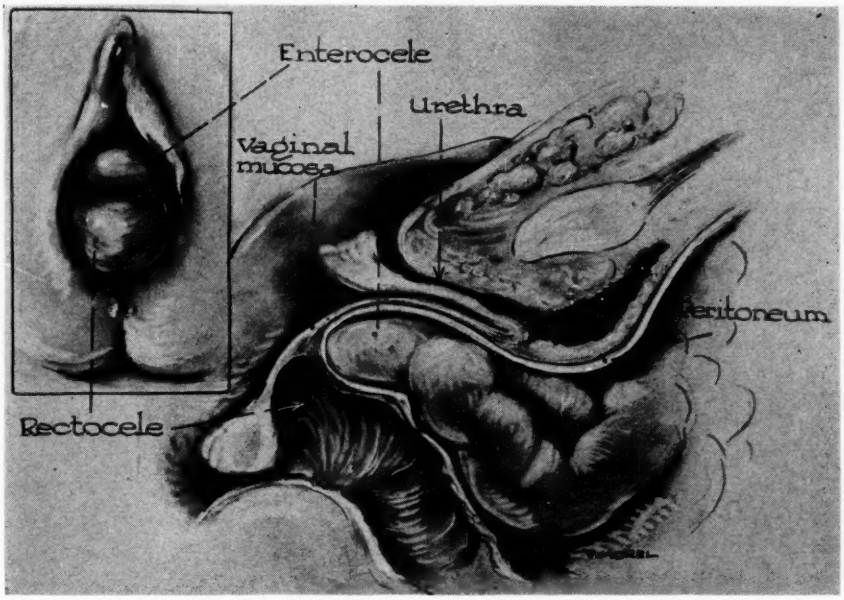

Fig. 1.—Enterocele without prolapse of the vaginal vault. Sagittal section is a diagram illustrating the extent of the hernial sac.

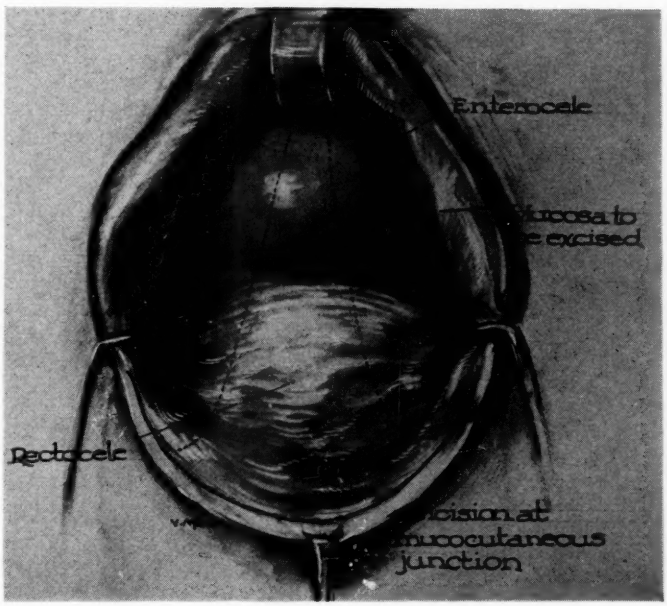

Fig. 2.—Incision of the posterior vaginal mucosa to illustrate the extent of dissection.

ined in the erect position. If this is done, the diagnosis will be made more frequently but, unless the condition is suspected, it may be overlooked entirely. Symptoms directed toward rectal difficulties should lead to suspicion and further examination. A little further investigation might have prevented embarrass-

ment to the surgeons who failed to correct the condition in three of our cases within eighteen months of the final operation. The difficulty of diagnosis is further illustrated in the case of one patient, examined as a possible compensa-

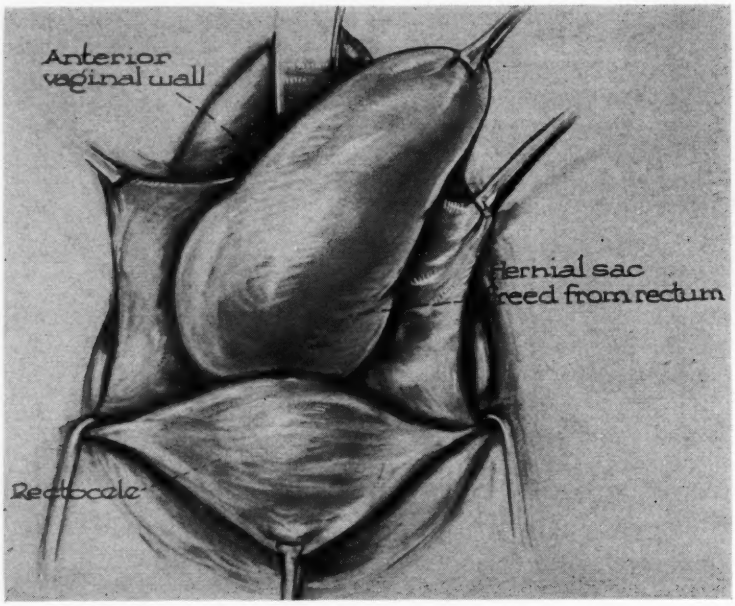

Fig. 3.—With the posterior vaginal mucosa elevated the hernial sac is dissected free from the rectum and vaginal mucosa.

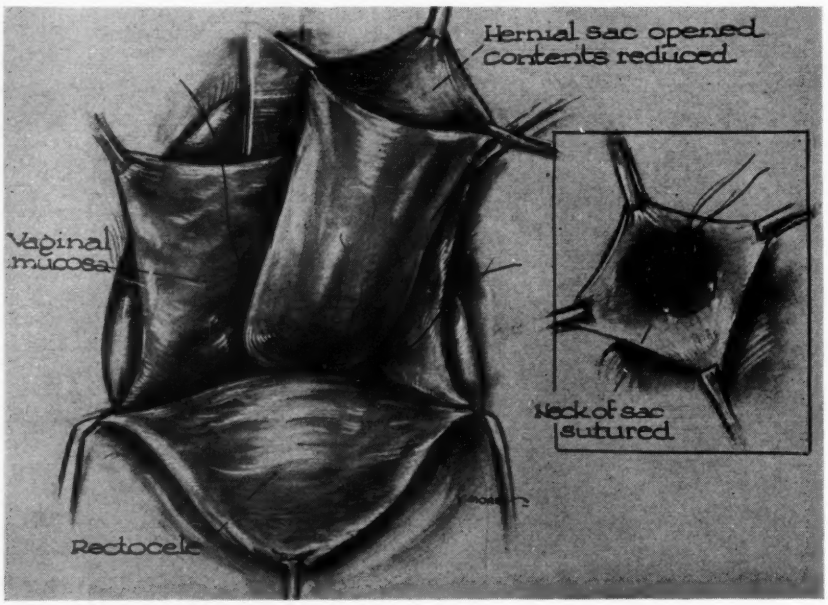

Fig. 4.—Hernial sac is opened, its contents reduced, and high ligation is employed.

tion case following an automobile accident. The pelvic viscera were normal but an enterocele was noted; its correction relieved the patient's backache and obviated compensation litigation.

The development of posterior vaginal hernia subsequent to vaginal or abdominal hysterectomy can possibly be prevented by proper inspection of the cul-de-sac, its obliteration, and proper approximation of the uterosacral liga-

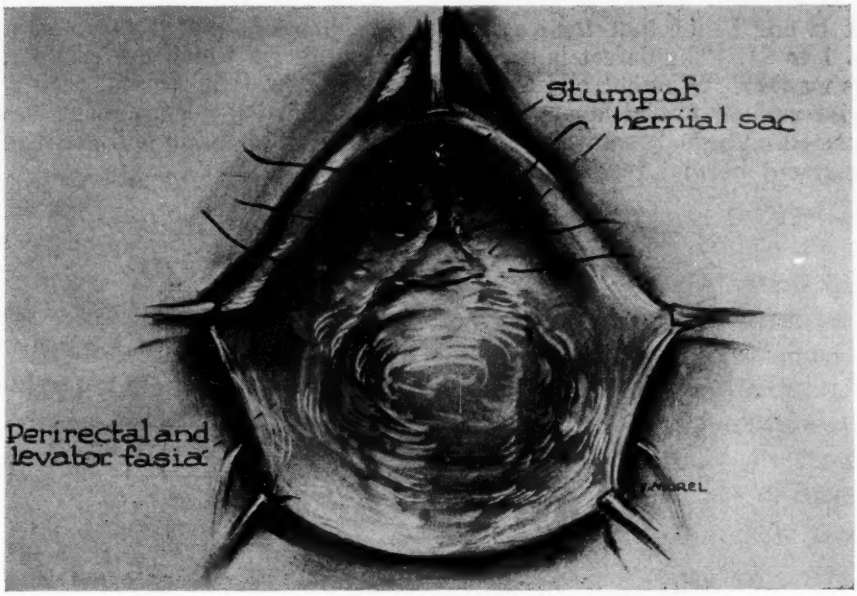

Fig. 5.—The ligated stump of the sac is buried by placing endopelvic fascia over it, continuing down to the levator ani fascia, which is approximated.

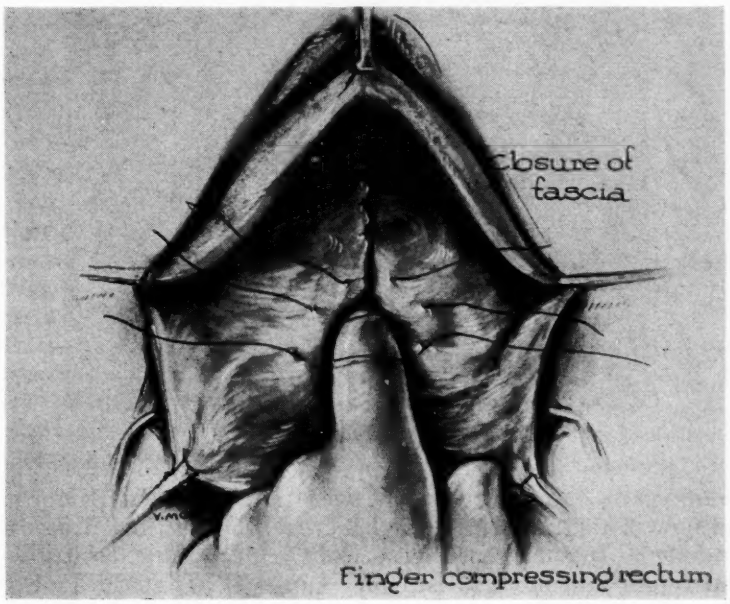

Fig. 6.—A second row of sutures further supports the posterior wall; this completes the perineorrhaphy.

ments. Should the anterior vaginal wall be shortened during vaginal hysterectomy, the latter procedure is essential. That one-third of the hernias in this series followed vaginal hysterectomy (five cases within one year) is evidence

either that the diagnosis was not suspected or that unsatisfactory closure of the cul-de-sac with inadequate repair of the vaginal vault ensued. The additional effort required to approximate the uterosacral ligaments and obliterate the cul-de-sac is certainly a good investment.

It is our belief that the vaginal approach offers the greatest advantages (Figs. 1 to 7). The defect is one of fascial supports which are easily reached in this manner. Whether or not the abdominal approach is used, repair of the posterior vaginal fascial layers must be accomplished if a permanent cure is to be expected. Vaginal removal of the uterus or cervical stump will often simplify and augment hernial repair.

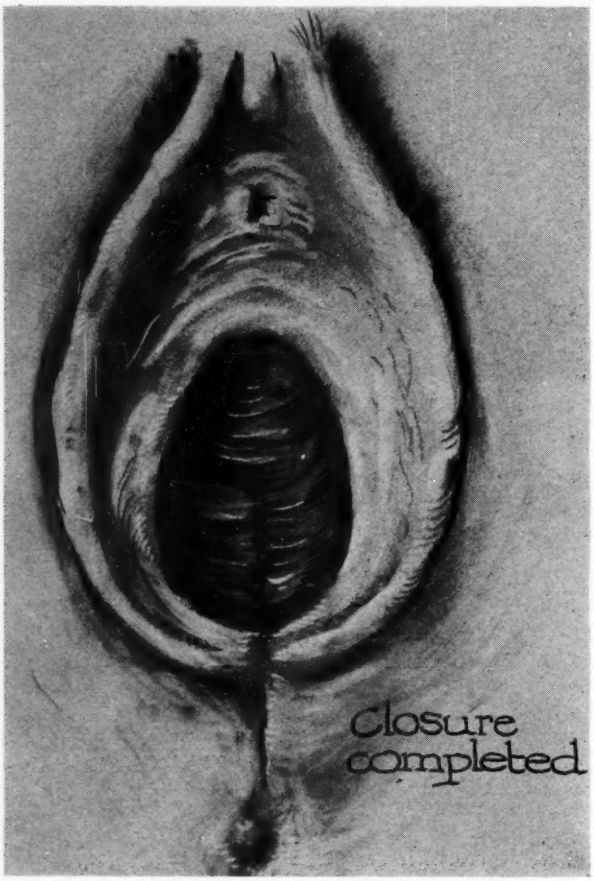

Fig. 7.—Complete posterior repair.

In recent years, the interposition operation has been performed less frequently and now is a surgical rarity. Likewise, the Le Fort procedure has been almost abandoned. In such cases colpocleisis is preferable, as it gives more adequate fascial repair and more satisfactory support. That the Le Fort operation requires less time to perform, is less shocking, and is more easily tolerated by older women is no longer tenable. Recent reports on surgery of the aged indicate that these factors have little effect.[6, 7] In the present series the morbidity in the Le Fort procedure approached 50 per cent.

In the cases in which it was necessary to retain a serviceable vagina, the vaginal approach has not caused serious difficulties. In two instances some

shortening of the vagina was noted postoperatively but did not lead to marital discord. It has not been necessary to employ abdominal fascial supports, as advocated by Fletcher[2] and Shaw,[3] in any of our cases of prolapse of the vaginal vault.

Summary and Conclusions

1. Enterocele, alone or in conjunction with prolapse of the uterus, cervical stump, or vaginal vault, is a relatively rare condition, occurring once in 1,000 gynecologic hospital admissions. Age, erect posture, and multiparity are important factors in its development.

2. Symptoms related to enterocele alone are referable to the rectum but may be obscured by symptoms of associated prolapse.

3. Enterocele may be overlooked at the time of vaginal hysterectomy or may follow inadequate support of the vaginal vault at the time of hysterectomy.

4. The rational approach to correction of enterocele is the vaginal route with excision of the sac and adequate restoration of fascial continuity.

5. The management of fifty-two cases of enterocele, with or without associated prolapse of the uterus, cervical stump, or vaginal vault, has been discussed. There were no deaths in this series and the morbidity was 20.7 per cent.

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Discussion

DR. G. KEITH FOLGER, Cleveland, Ohio.—Since January, 1942, the diagnosis of enterocele has been recorded 95 times in 52,996 admissions to the University Hospitals of Cleveland. Sixty-one cases have been operated upon for repair of the enterocele, an incidence of one operation to 869 admissions. I do not have complete data on the thirty-four cases in which the diagnosis was made but no operation carried out on the patient. Our statistics are in agreement with the figures given by the authors of this paper.

The patient who presents the picture of procidentia, in which all structures are attenuated and ill defined, and yet wishes to preserve the sexual functions, presents a problem that can be formidable in the best of hands. The many procedures described in the literature testify to the many attempts to devise a satisfactory solution to this problem.

The authors stressed the point that the main symptoms of enterocele are referred to the rectum. This is a most valuable point to remember. In this series one-third of the hernias followed hysterectomy within one year. This certainly emphasizes the importance of careful scrutiny of the cul-de-sac before and during operations. Several writers have stressed prophylactic measures in patients having an unusually deep cul-de-sac, whether an enterocele was present at the time of surgery or not. Meigs advocated opening the abdomen after repair of an enterocele for inspection of the suture line, to reinforce it where necessary. We have not found this necessary.

Norman Miller reported an operation in 1927 for the correction of a complete inversion of the vagina. He opened the vaginal vault and sutured the vault to the base of the uterosacral ligaments on each side of the rectum. I have seen few references to this procedure

and would like to ask the authors if they have used it for closing the defect between the uterosacral ligaments. I would also like to ask what technique is used in those cases in which the uterosacral ligaments are so attentuated that they cannot be identified. Is high ligation enough?

I would like to report a case operated upon in our service to illustrate a complication that can occur. This patient was a 46-year-old gravida vii, para v. She was first operated upon in April, 1945, with the diagnosis of uterine prolapse, relaxed pelvic floor, and cystocele. A vaginal hysterectomy, anterior colporrhaphy, and a perineorrhaphy were done. She was readmitted one year later with a diagnosis of enterocele and rectocele. A Moschcowitz type of operation was done combined with colpoperineorrhaphy. She was admitted again nine months later because of a recurrent enterocele and rectocele. There was a marked bulging high along the posterior vaginal wall, which had dissected down the rectovaginal septum. While operating upon the bulge in the posterior vaginal wall, the surgeon opened up a cyst, containing about 400 c.c. of clear yellow fluid. The surgeon was sure that he had opened into the bladder. On further investigation, it proved to be a peritoneal cyst which had formed in the previously obliterated pouch of peritoneum. A high rectopexy and a posterior colpoperineorrhaphy were done successfully and the patient has remained cured.

Surgery in the older age group has been made safer. This is due in a large part to better medical care pre- and postoperatively and to the antibiotics. The Le Fort operation has been very satisfactory in our hands for the elderly patient in whom marital relations are no longer important. I do not feel that it should be abandoned for the more extensive colpocleisis. Surgery is still the "substitution of one abnormality for another one." We hope it is an improvement for the patient.

Original Communications

STUDIES ON PREMATURITY

I. Incidence and Obstetrical Considerations

WILLIAM POMERANCE, M.D., AND MORRIS STEINER, M.D., BROOKLYN, N.Y.

(From the Departments of Obstetrics and Pediatrics of the Jewish Hospital of Brooklyn)

PREMATURITY has been recognized as the most important factor in fetal and neonatal mortality. The necessity for additional studies of hospital statistics concerning premature infants has been emphasized recently by Dunham.[1] The present study concerns itself with an analysis of all premature births at the Jewish Hospital of Brooklyn during the five-year period from Jan. 1, 1941, through Dec. 31, 1945.

We have divided our study into four parts in order to facilitate more complete analysis and to emphasize certain of the results brought out by the data. The first report, which follows below, is concerned with an investigation of the incidence of prematurity together with obstetrical considerations in connection with the delivery of such infants. Subsequent reports will deal with the influence of the length of the gestation period on fetal survival, the relationship of maternal toxemia to fetal survival, and finally the influence of the length of gestation period on the lag in initial gain of weight of the infants.

Material

The various maternal and fetal factors concerned in the incidence of stillbirths, neonatal mortality, and morbidity were investigated within the limits of the criteria outlined below. Included in the statistics were all liveborn infants weighing less than 2,250 grams (five pounds), regardless of the length of gestation period. No exclusions were made on the basis of "nonviability." Infants weighing between 2,250 and 2,500 grams, though ordinarily regarded as "premature," were not considered in this study because it was felt that the inclusion of these babies would merely "dilute" the figures and serve to minimize the greater problems arising in connection with the survival of small infants. As will be seen later, the survival rate of infants with birth weight between 2,000 and 2,250 grams was 98 per cent. No doubt the survival rate of the larger babies (many of them full-term) would have been found to be even higher.

For purposes of study, infants were grouped in weight categories as follows:

1. Less than 1,000 grams
2. 1,000 grams to 1,499 grams
3. 1,500 grams to 1,999 grams
4. 2,000 grams to 2,250 grams

A separate grouping of infants on the basis of length of gestation period was made as follows:

1. 29 weeks or less
2. 30 weeks to 33 weeks
3. 34 weeks to 37 weeks
4. 38 weeks to 40 weeks

Infants of multiple births were in some instances considered as a group apart, the criteria employed being the same as for the single birth. Infants weighing less than 2,250 gram who were stillborn were listed as premature if the gestation period was 22 weeks or longer or the body length was at least 35 centimeters.

Incidence of Prematurity

During the period of study there were 20,234 births. Of these, 962 babies, or 4.8 per cent, satisfied the above statistical requirements. This incidence is lower than the usually reported incidence of prematurity, for the obvious reason that we have excluded babies weighing between 2,250 and 2,500 grams, a group which constitutes about 50 per cent of the infants usually considered to be prematurely born. If one takes this factor into consideration it becomes apparent that the incidence of prematurity in our series is comparable to that generally found.

We have analyzed our data from a number of standpoints in order to bring to light the possible bearing on premature births of emotional factors, seasonal factors, economic status, parity of the mother, and complications of pregnancy.

It appeared to us that if emotional factors played a role in inducing premature labor it might be reflected in a greater number of premature births during the war years when many of the prospective mothers were separated from husbands who were engaged in active combat. In Table I it may be noted, however, that there was no significant change in the incidence of prematurity even during the height of the war in 1944. The conclusion is, of course, not warranted that acute psychic trauma has no importance in individual cases.

A tabulation of the number of births by months did not reveal any significant seasonal variation.

Influence of economic status could be approximated only by a comparison of the premature birth rates for ward and private patients. It was noted that for each year there was a consistently higher incidence of prematurity in our ward cases. One might infer from this that the lower economic status and presumably poorer nutritional state[2] of ward patients adversely affected the duration of pregnancy. However, it has been shown that there are racial variations[2, 3] in the birth weight of infants, Negro babies weighing significantly less than white babies. Our figures, therefore, may be a reflection only of the high Negro population of our wards as compared with the almost complete absence of Negro patients among our private cases.

TABLE I. INCIDENCE OF PREMATURITY* FROM 1941 THROUGH 1945

	TOTAL BIRTHS	SINGLE BIRTHS		MULTIPLE BIRTHS†	TOTAL PREMATURE BIRTHS	
		NUMBER	PER CENT		NUMBER	PER CENT
1941	3286	156	4.7	29	185	5.6
1942	4094	137	3.3	33	170	4.2
1943	4206	147	3.5	38	185	4.4
1944	4046	169	4.2	27	196	4.8
1945	4602	185	4.0	41	226	4.9
Total	20234	794	3.9	168	962	4.8

*This study includes infants weighing less than 2250 grams (5 pounds).

†The term "multiple births" is used throughout this report to indicate infants resulting from the birth of twins or triplets.

With regard to parity of the mother, the data indicate (Table II) that 61 per cent of the total number of premature births occurred in primiparous women. This figure is in accord with that given in previous reports.[5]

TABLE II. INCIDENCE OF PREMATURITY IN RELATION TO PARITY (SINGLE BIRTHS)

	TOTAL BIRTHS		PREMATURE BIRTHS	
	NUMBER	PER CENT OF TOTAL	NUMBER	PER CENT OF TOTAL
Primiparas	10,370	51	485	61
Multiparas	9,864	49	309	39
Total	20,234	100	794	100

There were 168 babies in the group of multiple births, i.e., twins and triplets, giving an incidence of 17.4 per cent of all premature births. This figure, although somewhat high, falls within the range of 6.3 to 22.9 per cent given by Dunham.[1]

Complications of pregnancy appeared to be the major factor in the incidence of premature births. In Table III it may be noted that some complication was found in 46.5 per cent of all women going into premature labor. As in most other studies[4] toxemia was by far the most frequent abnormality encountered (20 per cent). It will be seen later that it was found to be an even more important cause of stillbirths. The second most frequent complication was bleeding in pregnancy. Actually its occurrence was greater than is indicated because bleeding was not recorded in the table when it was a manifestation of another abnormal condition or when its importance was superseded by some other complication. Thus, where the bleeding was recognized as being due to ablatio placentae the condition was tabulated under the latter diagnosis. Furthermore, if bleeding occurred during the course of toxemia, the case was listed only as toxemia regardless of whether or not a diagnosis of ablatio placentae was made. We have excluded premature rupture of membranes as a complication because it is our belief that rupture of the membranes results from the operation of the factors that bring about the onset of labor, and is therefore only a manifestation of the soon to appear (if not already present) uterine contractions of labor.

TABLE III. PREGNANCY COMPLICATIONS (IN 794 SINGLE BIRTHS)

MATERNAL ABNORMALITY	NUMBER	PER CENT OF TOTAL SINGLE BIRTHS
I. Toxemia	161	20
II. Bleeding		
a. Unexplained vaginal bleeding	62	8
b. Ablatio placentae	34	4
c. Placenta previa	28	4
III. Abnormalities of genital tract		
a. Fibromyomas	24	3
b. Double uterus	5	
c. Previous vaginoplasty	3	
d. Previous myomectomy	2	
IV. Syphilis	9	1
V. Serious illness of mother		
a. Rheumatic heart disease	12	2
b. Diabetes	2	
c. Pyelitis	2	
d. Bartholinitis	2	
e. Miscellaneous	12	2
VI. Polyhydramnios	11	1
Total	369	46.5

Obstetrical Considerations

In studying the obstetrical factors involved in the management and delivery of the mothers concerned in the present series of cases we considered the following relationships for single births:

1. Frequency of various types of fetal presentation.
2. Fetal mortality rate in relation to type of presentation and method of delivery.
3. Influence of premature rupture of membranes on fetal mortality.

For multiple births, the fetal mortality rate of the second twin was analyzed in relation to the method of delivery employed. Finally, a tabulation was made of the stillbirths from the standpoint of their association with maternal and fetal complications.

1. Frequency of Various Types of Fetal Presentation.—

Of 794 single births, there were 619 (78 per cent) in which the presentation was by vertex and 130 (16.4 per cent) in which the presentation was by breech. This latter figure is to be compared with an incidence of 3.7 per cent of breech presentations for all deliveries (full-term and premature) during the period of study. The greater incidence of breech presentations in the premature infants was to be expected since many more fetuses present by the breech in the earlier weeks of gestation than they do at term. Similarly there appeared to be an increase in the incidence of transverse presentations (Table IV).

TABLE IV. FREQUENCY OF VARIOUS TYPES OF PRESENTATION (SINGLE BIRTHS)

PRESENTATION	NUMBER	PER CENT OF TOTAL SINGLE BIRTHS
Vertex	619	78.0
Breech	130	16.4*
Transverse	9	1.1
Face	4	0.5
Undetermined	32	4.0
Total	794	100

*This figure may be compared with an incidence of 3.7 per cent of breech presentations in the entire group of 20,234 deliveries.

2. Fetal Mortality Rate in Relation to Type of Presentation and Method of Delivery.—

There were 546 vertex presentations with 81 neonatal deaths (16 per cent) as compared with 103 breech presentations and 29 deaths (34 per cent) (Table V). It would appear from these figures that breech presentation was associated with a much higher mortality rate than vertex presentation.[7] However, when this factor was analyzed in relation to birth weight (Table VI), it was found that the difference in mortality held true only for babies weighing less than 2,000 grams. In the group weighing between 2,000 and 2,250 grams the fetal mortality for infants who presented by the breech did not differ significantly from that of infants who presented by the vertex.

Spontaneous vertex delivery appeared to be associated with a higher neonatal death rate (18 per cent) than delivery by low forceps (eight per cent) (Table V). This finding is consistent with most reports in the literature.[6] Closer examination of the data showed this to be an unwarranted conclusion. On analysis of the figures in relation to birth weight of the infant (Table VI) it was found that there was no significant difference in the mortality rate for babies who presented by the vertex regardless of the method of delivery employed. The higher mortality rate associated with spontaneous vertex delivery was discovered to be due to the proportionately greater number of infants weighing less than 1,000 grams who were delivered spontaneously.

TABLE V. FETAL MORTALITY IN RELATION TO PRESENTATION AND METHOD OF DELIVERY (SINGLE BIRTHS)

		STILLBIRTHS*		NEONATAL DEATHS*	
	TOTAL NUMBER	NUMBER	PER CENT	NUMBER	PER CENT
Vertex	546	25	5	81	16
Spontaneous	397	17	4	67	18
Low forceps	102	3	3	8	8
Midforceps	11	1	9	0	0
Version	4	2	50	0	0
Cesarean	32	2	6	6	20
Breech	103	18	17	29	34
Spontaneous	43	10	23	15	46
Assisted breech	36	3	8	10	30
Breech extraction	21	3	14	3	17
Decomposition	1	1	100	0	0
Cesarean	1	0	0	1	100
Vaginal hysterotomy	1	1	100	0	0
Transverse	7	1	14	2	33
Version	6	1	17	2	40
Cesarean	1	0	0	0	0
Face	2	0	0	0	0
Spontaneous	2	0	0	0	0
Undetermined	28	4	14	9	38
Vaginal	8	1	13	5	71
Cesarean	19	2	11	4	24
Vaginal hysterotomy	1	1	100	0	0
Total	686*	48*	7	121†	19

*Exclusive of 98 dead on admission and 10 monstrosities.
†Exclusive of babies that died after tenth day of life.

In order to evaluate the mortality rate of infants delivered by cesarean section it was necessary to select for comparison a group of patients who had similar obstetrical complications but who were nevertheless delivered by the pelvic route. It was considered that those cases in which labor was induced by artificial rupture of the membranes closely approximated the requirements for comparative study. All of these patients presented some serious disorder of pregnancy (e.g., toxemia, placenta previa) and termination of the pregnancy was deemed essential in spite of the premature status of the fetus.

It was found (Table VII) that the fetal loss resulting from labor and delivery was much higher for the group in which labor was induced than it was for the group delivered by cesarean section. In a group of 47 women with induced labor, 19 (40 per cent) of the fetuses died during the labor, whereas in a group of 52 patients who were delivered by cesarean section, four (eight per cent) of the fetuses were stillborn. However, the neonatal mortality rate for the group of infants delivered by cesarean section was higher than that for the group delivered by induced labor, 17 per cent as compared with 7 per cent. This may in part be explained by the greater number of smaller babies who were spared the rigors of pelvic transit and who then died shortly after birth. Another factor may be that brought out by the observation of Gellis, White, and Pfeffer,[8] who found that the stomachs of infants delivered by cesarean section contained large amounts of swallowed amniotic fluid which could be regurgitated and aspirated. It is possible that the technique of gastric suction advocated by these observers may lower the neonatal mortality rate for babies delivered by cesarean section. In spite of the greater neonatal mortality rate of such babies, the over-all mortality rate (fetal and neonatal deaths) was lower for this group (23 per cent) than it was for the one in which labor was induced by rupture of the membranes (45 per cent).

TABLE VI. FETAL MORTALITY IN RELATION TO PRESENTATION, METHOD OF DELIVERY, AND BIRTH WEIGHT (SINGLE BIRTHS)

METHOD OF DELIVERY	LESS THAN 1,000 GRAMS			1,000-1,499 GRAMS			1,500-1,999 GRAMS			2,000-2,250 GRAMS		
	NUMBER	DIED	PER CENT MORTALITY	NUMBER	DIED	PER CENT MORTALITY	NUMBER	DIED	PER CENT MORTALITY	NUMBER	DIED	PER CENT MORTALITY
Spontaneous vertex	33	33	100	49	15	31	134	9	7	158	3	2
Low forceps	3	2	67	9	3	33	37	2	6	49	0	0
Midforceps	0		--	0		--	3	0	0	7	0	0
Spontaneous breech	10	10	100	6	2	33	10	3	30	7	0	0
Assisted breech	4	4	100	2	2	100	7	1	14	17	1	6
Breech extraction	0		--	4	3	75	7	1	14	8	0	0

TABLE VII. FETAL AND NEONATAL MORTALITY IN RELATION TO METHOD OF DELIVERY (SINGLE BIRTHS)

METHOD OF DELIVERY	NUMBER	DIED IN LABOR AND DELIVERY		NEONATAL MORTALITY		TOTAL MORTALITY	
		NUMBER	PER CENT	NUMBER	PER CENT	NUMBER	PER CENT
Induced labor*	47	19	40	2	7	21	45
Cesarean section	52	4	8	8	17	12	23

*In all cases labor was induced by rupture of membranes.

3. Influence of Premature Rupture of Membranes on Fetal Mortality.— Premature labor often begins with rupture of the membranes and not infrequently several days elapse before labor pains make their appearance. Some observers believe that this situation places the fetus in jeopardy. We have compared the fetal mortality rate in those cases in which the membranes ruptured before the onset of labor, or at the onset of labor, with the results in those cases where the membranes remained intact until shortly before delivery (second stage). It can be seen (Table VIII) that there was no difference in the fetal mortality rate irrespective of whether the membranes were intact at time of delivery or had ruptured at or before onset of labor.

TABLE VIII. RELATIONSHIP BETWEEN TIME OF RUPTURE OF MEMBRANES AND FETAL MORTALITY (SINGLE BIRTHS)

	TOTAL	DIED IN LABOR		NEONATAL DEATH		TOTAL FETAL LOSS
		NUMBER	PER CENT	NUMBER	PER CENT	PER CENT
Ruptured spontaneously at or before onset of labor	264	16	6	43	16	22.3
Ruptured during second stage	192	9	5	42	22	26.6

4. Relation Between Method of Delivery of the Second of Twins and Fetal Mortality.—

In our hospital it is the practice of most of the obstetricians to deliver the second of twins as soon as the first baby has been given proper care. Unless the birth of the second baby appears to be imminent it is delivered by version if the head is high or out of the pelvis, or by forceps if the head is well in the pelvis, or by breech extraction if it presents by the breech. There are some observers[7] who have deprecated such procedures, especially where premature infants are involved. In Table IX are shown our results with respect to the delivery of the second of twins in each of the multiple births where at least one baby weighed less than 2,250 grams. It would seem that the highest mortality rate was associated with spontaneous delivery regardless of the type of presentation. However, as was apparent in the analysis of the method of delivery in

TABLE IX. MORTALITY OF SECOND OF TWINS IN RELATION TO METHOD OF DELIVERY

METHOD OF DELIVERY	TOTAL	DIED	MORTALITY PER CENT
Spontaneous vertex	25	3	12
Low forceps vertex	6	0	0
Midforceps vertex	5	0	0
Spontaneous breech	11	2	18
Breech extraction	25	1	4
Version and breech extraction	25	1	4
Cesarean section	5	2	40
Total	102	9	9

single births (Table VII) it is necessary to take into account the birth weight of the infant. It is probable that proportionately more of the infants who were delivered spontaneously fell into the group weighing less than 1,000 grams, where the mortality rate was highest. On the other hand, the results with operative deliveries of the second twin were excellent.

Stillbirths

There were 171 stillborn infants in this series of cases. It should be mentioned that the incidence of stillbirths in the statistics of different authors may vary depending on the standards adopted. Many fetuses were included in the present study only because of the rigid standards employed in the differentiation of stillbirths from abortions. As outlined above, dead fetuses having attained a minimum length of 35 centimeters or a gestational age of 22 weeks were con-

TABLE X. STILLBIRTHS

	NUMBER OF CASES	
Single births	157	
Multiple births	14	
Total		171
I. *Dead on Admission (Before Labor).*—		
Clinical diagnosis:		
Toxemia	39	
Ablatio placentae	19	
Vaginal bleeding	3	
Abnormality of umbilical cord	3	
Prolapsed cord	3	
Fibromyomas	1	
Previous myomectomy	1	
Lupus erythematosus	1	
Postpartum thrombosis (middle cerebral artery)	1	
Congenital fetal abnormality	1	
Syphilis (?)	1	
Multiple sclerosis	1	
Diabetes	1	
Heart disease	1	
Cause unknown	31	
Total		107
II. *Died During Labor.*—		
Clinical diagnosis:		
Toxemia	13	
Ablatio placentae	11	
Placenta previa	5	
Congenital abnormalities	5	
Prolapsed cord	1	
Abnormality of umbilical cord	1	
Amnionitis	1	
Transverse presentation	1	
Fibromyomas	1	
Cause unknown	15	
Total		54
III. *Monstrosities.*—		
Clinical diagnosis:		
Prolapsed cord and placenta previa	1	
Toxemia	1	
Ablatio placentae	1	
Maternal heart disease	1	
No complication	6	
Total		10
Total		171

sidered to be stillborn. It is our belief, furthermore, that many of the stillbirths were actually instances of babies who were born alive but who died shortly after delivery. Responsibility for this error lies in the attitude, commonly assumed by many obstetricians, that a "nonviable" infant is stillborn even if it shows evidence of life for a short period of time.

Of the 171 stillborn infants, 107 were dead on admission of the mother to the hospital, while 54 died during labor. Monstrosities account for the remaining ten. Toxemia of pregnancy was the most common complication found in the mother while ablatio placentae was next in order of frequency (Table X). These two maternal complications occurred in association with 50 per cent of the stillbirths whereas they were present in 24 per cent of all single births, live, as well as stillborn.

Summary and Conclusions

1. An analysis has been made of the incidence of prematurity as well as the obstetrical factors involved in the delivery of premature infants at the Jewish Hospital of Brooklyn during the five-year period of 1941 to 1945.

2. All liveborn babies weighing less than 2,250 grams were included in the study. Infants of this weight group who were stillborn were considered to be premature if the gestation period was 22 weeks or longer or if the body length was at least 35 centimeters.

3. On the basis of the above criteria there were 962 premature births among a total of 20,234 deliveries, an incidence of 4.8 per cent.

4. There was no significant variation in incidence of prematurity during the five-year period studied.

5. There was a greater incidence of prematurity among the ward patients than among the private patients. This difference may have been due to the greater number of Negro patients on the ward service as well as to the lower economic status of all ward patients.

6. There was no seasonal or monthly variation in the incidence of prematurity.

7. There was a greater incidence of prematurity in primiparous women.

8. It was found that 17.4 per cent of the premature infants resulted from the birth of twins or triplets.

9. Complications of pregnancy were the major factor in the incidence of premature births. Of these, toxemia of pregnancy and gestational bleeding were the two most frequently encountered. Moreover, these two factors accounted for the greatest number of stillbirths.

10. Breech presentation was found to occur with considerably greater frequency in connection with premature births than it did in association with full-term deliveries.

11. There appeared to be a greater neonatal mortality rate associated with spontaneous delivery than with forceps delivery. Regrouping of the data on the basis of fetal birth weight failed to support this conclusion and indicated that there was no advantage as regards neonatal survival when forceps delivery was employed.

12. Breech presentation was associated with a higher neonatal mortality rate as compared with vertex presentation only in the groups of smaller infants.

There was no difference in the neonatal mortality rates for the two types of presentations in babies weighing between 2,000 and 2,250 grams.

13. Operative delivery of the second of a set of premature twins did not prejudice its survival.

14. Premature rupture of the membranes was not associated with any greater neonatal mortality than was late rupture of membranes.

15. Delivery by cesarean section resulted in a lower fetal mortality rate than delivery per vaginam following induction of labor by rupture of membranes. However, the neonatal mortality rate for premature babies born by cesarean section was higher than that for babies born as the result of induced vaginal delivery.

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PREMENSTRUAL TENSION

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PREMENSTRUAL tension is the term applied[1] to a symptom-complex which begins about 10 to 14 days premenstrually, reaches its peak shortly before menstruation, and disappears dramatically following the onset of the menstrual flow. In some instances the symptoms may persist to a lesser degree throughout the cycle. Unlike the mild premenstrual discomfort which almost half of all women undergo[2] (and philosophically accept), premenstrual tension often causes a distressing impairment of the sufferer's psychic and physical well-being.

Premenstrual tension is usually ushered in by a feeling of mild depression or anxiety, and is associated with such symptoms as headache, insomnia, emotional instability, fatigue, painful swelling of the breasts, abdominal bloating, low abdominal pain, nausea with occasional vomiting, and, infrequently, increased sexual desire. Another symptom, rarely mentioned in the literature, is increased appetite and thirst. Thorn, Nelson, and Thorn[2] found this a striking symptom in the premenstrual period.

Premenstrual tension has been reported to occur more frequently and with greater intensity in emotionally unstable women. Their mental[5, 6] and nervous symptoms[7] are often intense at the height of the syndrome, and the clinical picture may simulate a psychoneurosis or a functional nervous disorder.

Although it has been generally accepted that ovarian activity is intimately associated with premenstrual tension, many differences in opinion have been expressed as to the actual etiology.[1, 2, 4, 8, 9, 10, 11, 12, 13, 14] This obscureness of etiology prompted the present study.

Clinical Observations

Twenty-nine ambulatory patients ranging from 20 to 45 years of age were the subjects of the current study. These patients were clinically free from diseases of the heart, lung, kidney, liver, or blood.

A detailed history was obtained in each case. The incidence of the principal symptoms as observed in these patients is summarized in Table I.

All of these patients exhibited or complained of some degree of internal tension and emotional instability during the premenstruum. In many instances the nervous and mental symptoms were outstanding. Nine patients had previously received some form of psychotherapy, so severe were the associated mental phenomena in the premenstruum. All our patients complained of depression, crying spells for no apparent cause, anxiety, marked restlessness,

insomnia, poor concentration, lack of mental alertness, hypersensitivity, feelings of unreality, and chronic fatigue. They frequently experienced an inability to concentrate and described a "groping for words." They felt unable to cope with routine daily problems and situations and were often mentally confused. A desire to withdraw from people, even intimates, and a marked fear of leaving the house were present in this trying premenstrual period. These psychic manifestations, together with the marked weakness and fatigue, created a pathetic picture. Four of these patients remained in bed for days during this phase.

TABLE I. PRINCIPAL SYMPTOMS IN 29 WOMEN WITH PREMENSTRUAL TENSION

SYMPTOMATOLOGY	INCIDENCE	PERCENTAGE OF CASES
1. Nervous and emotional instability	29	100
2. Painful swelling of breasts	22	76
3. Increased appetite	17	59
4. Lower abdominal pain	16	55
5. Abdominal bloating	15	52
6. Gain in weight and/or edema	13	45
7. Menstrual disturbances	12	41
8. Headaches	9	31
9. Nausea and vomiting	3	10
10. Increased sexual desire	3	10
11. Vaginal itching	2	7

Two patients had previously received shock therapy. Three others had symptoms suggestive of cerebral neoplasm. In one of these patients, premenstrual headaches, papilledema, vertigo, and vomiting, as well as roentgen findings suggesting increased intracranial pressure, disappeared after the onset of menstruation.

Painful swelling of the breasts occurred in 22 patients as an outstanding symptom. This symptom recurred cyclically in the premenstrual period and usually subsided rapidly after the menstrual flow began. In a few patients this symptom persisted throughout the cycle but was greatly exaggerated in the premenstrual phase. In all the patients with breast symptoms, one or more varieties of chronic cystic mastitis[10] were present.

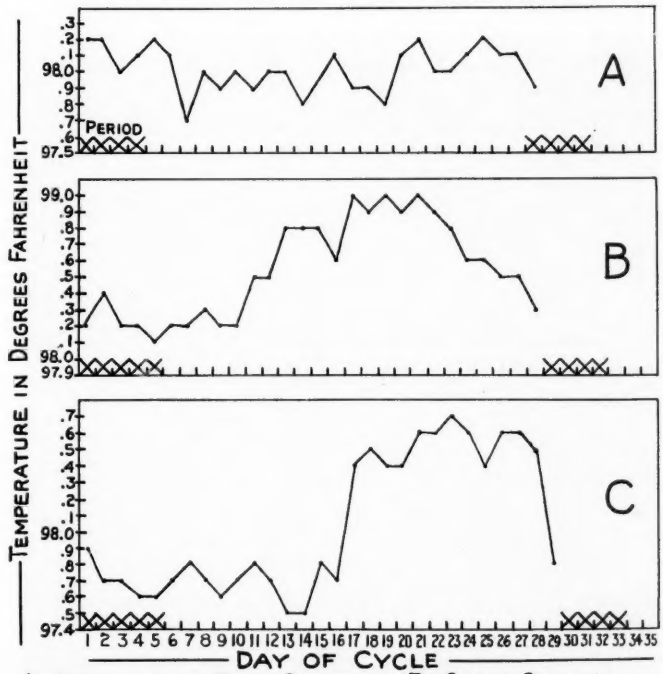
Seventeen patients mentioned increased appetite or an abnormal craving for sweets as a prominent symptom in the premenstrual phase. Five of these patients, who experienced sudden attacks of profound fatigue or faintness, were relieved by eating. Two patients had these attacks during the night and eventually found that eating before retiring abolished or minimized the attack. Fourteen patients had experienced the "shakes." This was described as a visible, uncontrollable trembling or shaking of the hands that would last from a few minutes to an hour. It usually occurred after a period of not eating, as before breakfast or in the late afternoon. The tremulousness was also noticed following exercise. Two patients discovered that the "shakes" as well as the weakness and fatigue could be alleviated, usually for about two hours, by eating candy, which they invariably carried in their handbags for this purpose. Other patients remarked that when they were hungry, or between meals, the fatigue and mental symptoms were more insistent.

A history of low abdominal pain was elicited as a prominent premenstrual symptom in 16 patients. In four patients the right adnexa were palpably tender and were thought to be the source of the pain. The pain frequently started as a vague discomfort early in the premenstruum and soon localized in one or both lower quadrants, usually in the region of the groin. The right side was more often involved than the left. The pain was frequently associated with a drawing sensation that radiated down into the thigh. This premen-

strual pain could not be associated with ovulation and was not accompanied by vaginal bleeding. The pain became progressively worse as the patient neared the menstrual flow and invariably subsided with the other symptoms of premenstrual tension following the onset of menstruation.

Thirteen patients noted a gain in weight in the premenstruum, with a corresponding loss during or after the menstrual flow. Many of them also mentioned painless swelling of the face or legs premenstrually. Two patients observed at midcycle a sudden marked puffiness of the face which subsided in about two days, only to recur one week later and persist until menstruation recurred.

FIG. 1 — BASAL RECTAL TEMPERATURE CHARTS.



A.- ANOVULATORY TYPE CURVE. — B.- CURVE SHOWING STEP-LIKE RISE DUE TO INADEQUATE LUTEINIZATION.
C.- NORMAL CURVE SHOWING ABRUPT RISE AT OVULATION.

Menstrual disturbances were observed by 12 patients. The most common aberration was a shortening of the cycle, which occurred in eight patients. The cycle was gradually decreased by two to fourteen days as compared with its length in previous years. Four patients were menstruating twice monthly at the time of this study. In one case, the polymenorrhea followed the prolonged administration of estrogen. Two patients mentioned a lengthening of the cycle. Two others had periods of amenorrhea of several months' duration. One of these patients had suffered from severe premenstrual tension for several years. Although she had not menstruated for five months, she had cyclic symptoms recurring monthly and lasting for several days. Five patients had hypermenorrhea as well as polymenorrhea.

Procedure

Twenty-three of the patients had an endometrial biopsy taken soon before, or within eighteen hours after, the onset of menstruation. Vaginal smears

were taken in the premenstrual phase in 28 patients. In 14 cases hormonal assays were done premenstrually on a total twenty-four-hour urinary output. The basal temperatures and body weights were recorded daily by all patients, and basal metabolic determinations were made in all cases.

Determinations of capillary permeability by the fluorescein method[15] were taken over the right breast and right leg before and after menstruation. Serum and urine sodium, potassium and chloride determinations were also made premenstrually and postmenstrually, usually on the same day as the fluorescein tests. The tests were done in the premenstrual phase between the eighteenth and twenty-fifth days and in the postmenstrual phase between the first and thirteenth days. Oral sugar tolerance curves were plotted—usually in the premenstruum, and occasionally postmenstrually as well.

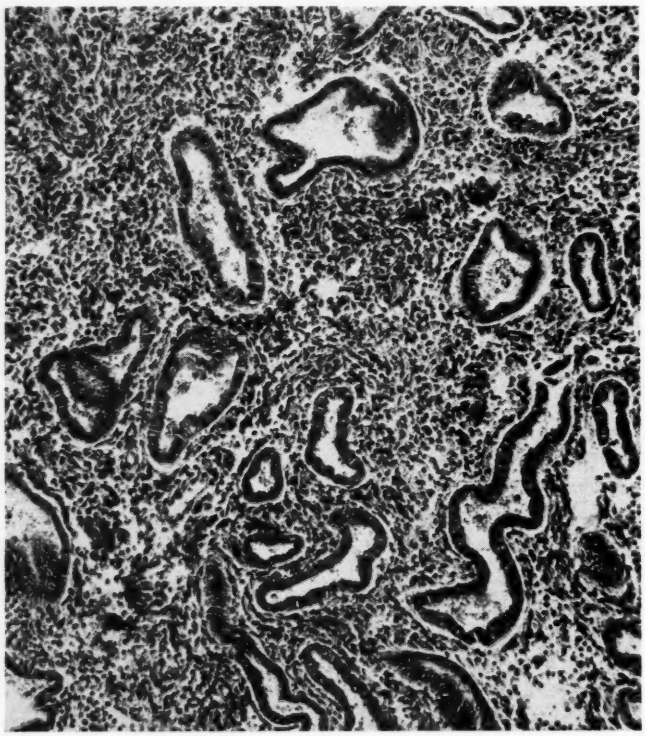


Fig. 2.—Premenstrual endometrial biopsies showing decreased progesteronic stimulation.

Findings and Interpretation of Data

The daily basal temperatures, the endometrial biopsy, the vaginal smear, and the urinary hormones indicated a decreased or absent secretion of progesterone which permitted an uninhibited rise of estrogen in the premenstrual phase. This estrogen-progesterone imbalance was demonstrated in the following ways:

The basal temperatures either failed to show the abrupt rise (attributed to progesterone secretion) at the midcycle, or presented irregularities associated with diminished luteal activity (Fig. 1) in 23 patients. The endometrium displayed a proliferative, or hyperplastic, or mixed proliferative and luteal picture on biopsy (Figs. 2 and 3) indicative of diminished luteal activity in 22 patients. By failing to show the characteristic luteal phase in the pre-

menstruum and by the persistence of cornified cells throughout the cycle, the vaginal smears similarly indicated an estrogen-progesterone imbalance with a *relative* excess of estrogen in 26 patients. The urinary hormonal assays revealed subnormal (less than 3 mg.) or absent pregnandiol excretion in 10 of the 14 patients, with normal or slightly lowered estrogen values in all 14 patients. The 17-ketosteroids did not show significant changes, although a trend toward lowered values in the premenstrual excretion was noted.

Two surgical castrates and one postmenopausal woman, who revealed no significant estrogenic activity, were given large doses of estrogen, with subsequent development of painful enlargement of the breasts, abdominal bloating, gain in body weight (with evident edema in one patient), and a nervous tension similar to that seen in patients with premenstrual tension.

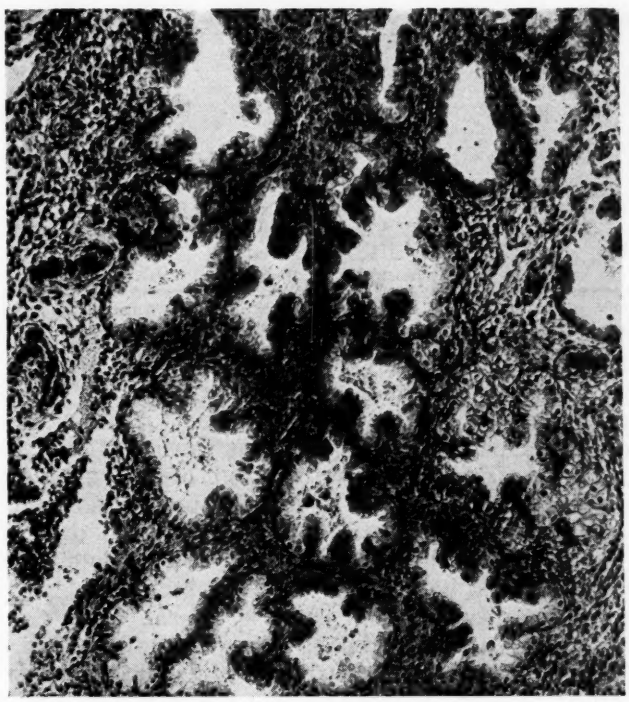


Fig. 3.—Premenstrual endometrial biopsies showing adequate progesteronic stimulation.

The fluorescein test showed a definite increased permeability (+12 to +41 per cent) over the breast in the premenstrual phase as compared with the postmenstrual phase in 10 of 21 cases. Only one patient showed a decreased permeability premenstrually (−16 per cent) and nine were within the normal range of +10 and −10. Over the leg, nine cases showed an increased permeability premenstrually (+11 to +46 per cent), four showed a decreased permeability (−15 to −33 per cent), and ten were normal. Although no definite conclusions are warranted, a definite trend toward increased permeability in the premenstruum is indicated. This trend was more marked in the breast than in the leg.

Determinations of the blood serum sodium and potassium in 23 cases before and after menstruation gave variable results. A tendency to decreased sodium and slightly increased potassium in the premenstrual phase and the opposite findings postmenstrually was noted in some cases. The fluctuations in the blood were not sufficiently significant, however, to warrant any conclu-

sions. In a few cases the calcium level in the blood serum was also estimated. Here again, a tendency to slightly decreased levels in the premenstrual phase was observed.

The urinary findings in 6 patients, however, showed definite changes. In all instances the total urine output in a twenty-four-hour period was markedly less in the premenstrual period than in the postmenstrual period. Similarly the sodium, potassium, and chlorides were excreted in larger quantities during and after menstruation (Table II). The premenstrual fluid retention in the extracellular tissue spaces coincided with the swelling of the breasts, the bloating of the abdomen, the appearance of edema, and the increase in general body weight.

TABLE II. BLOOD AND URINE FINDINGS (CASE 19)

	24TH DAY	6TH DAY
Blood Serum.—		
Na	145 meq. per liter	145 meq. per liter
K	4.5 meq. per liter	4.5 meq. per liter
Cl	107 meq. per liter	104 meq. per liter
Urine.—		
Volume	1120 c.c. output	1550 c.c. output
Na	101 meq. output	194 meq. output
K	71.6 meq. output	96.1 meq. output
Cl	112 meq. output	157 meq. output
17-Ketosteroids	12. mg. output	14.6 mg. output
Creatinine	1.5 Gm. output	1.21 Gm. output

In the premenstruum, definite weight gain occurred in 19 patients, although only 13 patients were previously aware of this fact. This weight was subsequently lost at or after the onset of menstruation. The range was 1 to 9 pounds, and the average gain premenstrually was 4 pounds.

The frequent occurrence of symptoms strongly suggestive of hypoglycemic reactions prompted the carrying out of the glucose tolerance tests. As a result thirty-six oral glucose tolerance curves were plotted for the 29 patients. Twenty-three glucose tolerance tests were done in the premenstrual period, one at midcycle and twelve in the postmenstrual period. Six patients had curves plotted before and after menstruation.

Sixteen of the 23 premenstrual glucose tolerance curves revealed an increased sugar tolerance as indicated by a low or flat plateau type curve or a normal curve with a delayed fall in the fourth hour to below normal values or below the initial fasting level. The blood sugar level during the test was often between 70 and 80 mg. per 100 c.c. of blood and in a few cases below 60 mg. Twelve of these 16 patients developed sudden faintness, weakness, apprehension, and perspiration during the test and gave the appearance of insulin shock (Fig. 4). This hypoglycemic attack either gradually subsided without treatment or responded more promptly following the ingestion of orange juice or milk. These sixteen patients had had premenstrual symptoms of increased appetite or a craving for sweets, chronic fatigue and psychic manifestations, and all but one had experienced the "shakes." Two patients had, on several occasions, nocturnal attacks of hypoglycemia.

Of the afore-mentioned 12 glucose tolerance curves plotted postmenstrually, not a single one showed a hypoglycemic type curve. Actually 3 patients showed high blood levels and developed glycosuria during the tests. Their curves were suggestive of decreased sugar tolerance.

Of the six patients who had glucose tolerance tests taken before and after menstruation (Fig. 5), five showed a hypoglycemic type curve premenstrually and one showed a normal curve. All six had definitely higher level curves postmenstrually.

Seventeen of the total 29 patients studied had definite psychic manifestations in the premenstruum. Only one of these did not have a hypoglycemic reaction during the glucose tolerance tests.

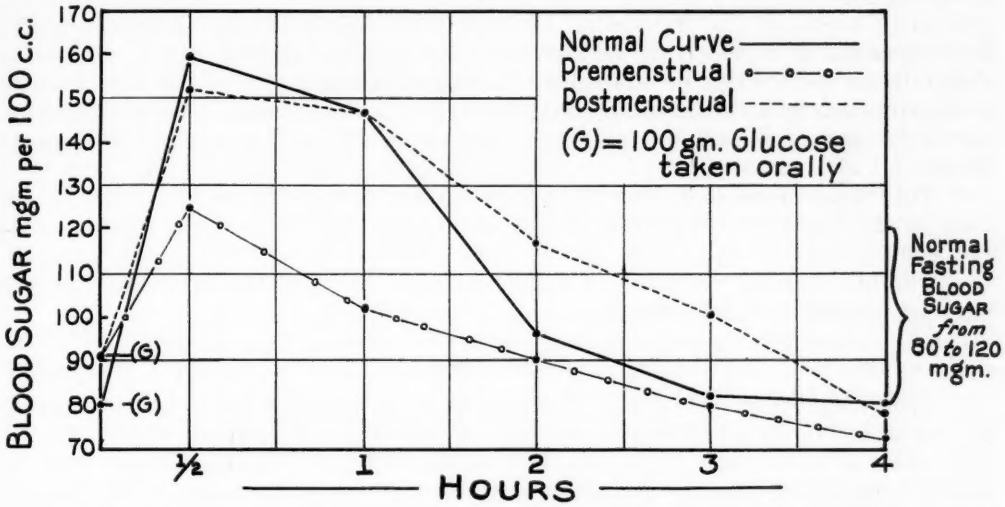


Fig. 4.—Oral glucose tolerance curves in premenstrual tension. Premenstrual curve represents average blood levels of 16 patients with severe premenstrual symptoms. Twelve patients displayed hypoglycemic reactions at third or fourth hours. Postmenstrual curve represents average blood levels of 11 patients with severe premenstrual symptoms. No hypoglycemic reactions noted.

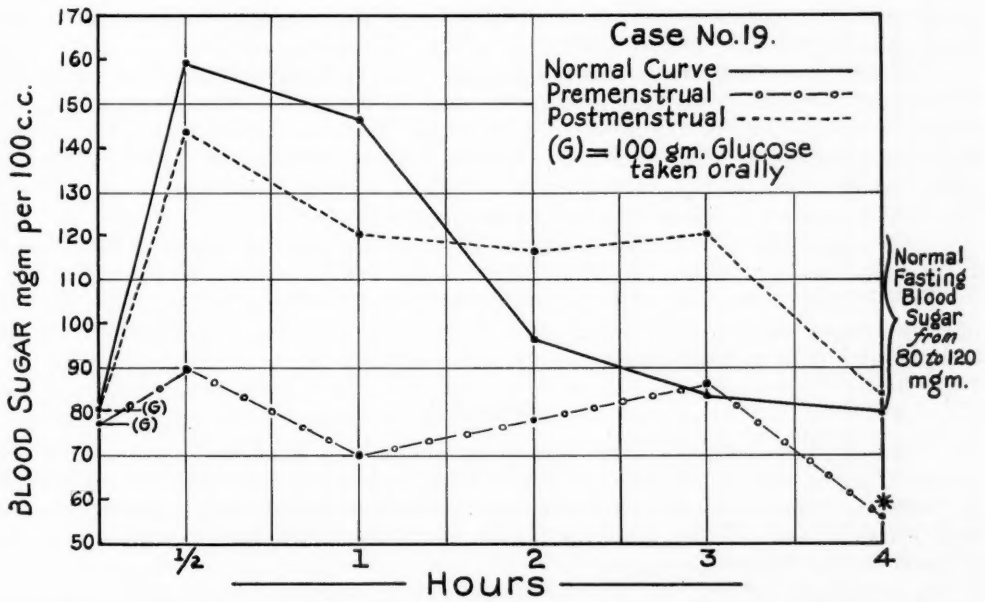


Fig. 5.—Oral glucose tolerance curves in premenstrual tension in Case 19. Premenstrual and postmenstrual sugar tolerance curves in a patient with premenstrual tension showing increased tolerance in the premenstrual phase. * denotes hypoglycemic reaction characterized by nervousness, weakness, apprehension, and sweating.

The above findings were interpreted to indicate that in the majority of our patients the diagnosis of at least subclinical hypoglycemia in the premenstrual period was established.

That the fasting blood sugar cannot be accepted as an index of hypoglycemia is indicated by the normal or only slightly lowered fasting blood sugar levels in our series. Because the same level may produce symptoms in one individual and not in another, even the glucose tolerance curve must be interpreted in terms of the individual and not on absolute levels. Apparently the hypoglycemia is a relative condition, and the absence or presence of symptoms depends on the ability or inability of the individual to raise the blood sugar level sufficiently to satisfy the actual needs of the tissues. This holds particularly true of the brain, the organ most sensitive to changes in blood sugar levels.

The basal metabolic determinations ranged from –2½ per cent to –15 per cent in 24 patients. The other five patients ranged from +1 per cent to +8¾ per cent.

The blood pressure was within normal range in all patients except one who showed a persistent hypotension.

Treatment

Treatment of premenstrual tension has been directed to the neutralization of the unantagonized estrogen or the control of its untoward effect. Favorable results have been reported with testosterone,[11, 21] progesterone,[5, 9] vitamin B complex,[8] chorionic gonadotropin,[7, 10, 22] roentgen therapy,[1, 9] salt restriction and diuretics.[1, 13]

Our approach to therapy was based primarily on the luteotropic effect of chorionic gonadotropin to increase progesterine secretion and thus correct the estrogen-progesterone imbalance. This preparation was given in doses of 500 to 1,000 units twice weekly for the last two weeks of the menstrual cycle. To avoid uduly postponing the onset of bleeding, the last injection was given not later than 3 or 4 days before the expected menstrual period.

During the first two or three months the following adjuvant treatment to control the symptoms was added to the administration of chorionic gonadotropin: to control the edema and weight gain, salt was restricted and diuretic and antispasmodic drugs were prescribed; to control the hypoglycemia a high-protein low-carbohydrate diet[17] with frequent feedings was advised. Thyroid extract was given in small or moderate doses.

Our experience with the vitamin B complex therapy showed it to be of value only in a few cases, but in these cases the results were quite gratifying.

With treatment, marked improvement ensued. Some of our patients who had not responded to psychiatric care improved mentally and physically when treatment of the hypoglycemic state was instituted.

Comment

Our studies indicate that the symptomatology and findings in premenstrual tension are dependent on a threefold action of estrogen which, due to the deficient secretion of progesterone, exhibits an uninhibited rise in the premenstrual phase. This unopposed estrogen may display its activity in one or more of the following ways:

1. It stimulates an increased epithelial proliferation and is responsible for the hyperplastic changes that occur in the breast, uterus, and vaginal epithelium. Most of the menstrual disturbances are attributed to this estrogenic hyperplasia in the endometrium.

2. It causes an increased retention of extracellular tissue fluid. This retention is manifested by an increase in body weight and edema, and may depend, at least in part, on the increased capillary permeability that occurs at this time. In all probability the abdominal bloating, the low abdominal pains, the nausea and vomiting, the vaginal itching, the painful distention of the

breasts, and at least some of the tension and headaches are the result of the disturbance in the electrolyte and water metabolism. (It is interesting to note that Joseph Novak [as quoted by discussant][14] found, while performing laparotomies, that the abdominal wall was hyperemic in the premenstrual phase and "dry" in the postmenstrual phase.)

3. It alters carbohydrate metabolism by increasing sugar tolerance. This disturbance in carbohydrate metabolism, as evidenced by a tendency to hypoglycemia, was at least as striking among our patients as the disturbance in electrolyte balance. The cyclic occurrence of increased sugar tolerance in the premenstrual phase strongly suggested that the hypoglycemia was functional in character. This view was supported by the complete lack of findings that might indicate hyperplasia or tumor of the pancreas, alimentary hyperinsulinism, hepatic disease, or renal glycosuria. In one patient, Addison's disease had to be ruled out by further studies.

The influence of estrogenic hormone on carbohydrate metabolism, especially in patients with diabetes mellitus, has been frequently reported in the literature. The author reviewed some of these studies in a previous publication[16] and presented a case in which the endogenous estrogen fluctuations during the menstrual cycle markedly altered the patient's carbohydrate tolerance. This patient uniformly lost tolerance with the onset of the menstrual flow when the estrogen secretion was low, and regained it at the midcycle and premenstrual phase when the estrogen secretion was high. Similarly, the administration of large doses of estrogenic hormone increased the patient's sugar tolerance and permitted a decrease in the amount of insulin required to keep the patient in balance.

The relationship of the asthenic syndrome of exhaustion and fatigue to carbohydrate metabolism has also interested investigators in both psychiatry and internal medicine. Rennie and Howard[18] considered functional hypoglycemia secondary to personality disturbances. Alexander and Portis[19] postulate that a loss of normal zest and enthusiasm results in a diminished stimulation of the sympathetic adrenal system and allows the parasympathetic tonus to predominate and hypoglycemia to develop. They found that the administration of atropine decreased the vagal tonus and permitted a blood sugar rise to the level required during mental or physical activity. Karlan and Cohn[20] were not able to obtain any beneficial effects from atropine, nor could they find any causal relationship between hypoglycemia and the emotional status. They concluded that hypoglycemic fatigue is a definite syndrome of unknown origin.

Because of the variable individual sensitivity to estrogen, not all women are affected in the same way. We have noted that the various effects of estrogen stimulation differed in intensity, often markedly, in our patients. This individual sensitivity warrants extreme caution in interpreting hormone assays and other tests unless marked deviations from the normal range occur.

Similarly it must be emphasized that the various determinations, such as the capillary permeability and the blood chemistries, would vary with the daily fluctuations in circulating estrogen. For instance, the capillary permeability, like the edema, may be more marked at the ovulatory period and again in the late premenstruum when the circulating estrogen reaches its two peaks. Obviously, determinations taken then would differ from those taken between the peaks. This may, in part at least, explain the wide range of some of our findings.

Our results are strongly suggestive, but far from conclusive. We make no attempt to explain the *modus operandi* of estrogen activity. Only further studies will show whether the estrogen effect is mediated through the pituitary-adrenal axis or through a more peripheral route.

Summary

Investigation of twenty-nine women with premenstrual tension indicates that the symptomatology is the result of an estrogen-progesterone imbalance with a *relative* excess of estrogen, due to deficient progesterone secretion. This conclusion was reached on the basis of endometrial biopsies, vaginal smears, basal temperatures, and urinary hormone assays.

The unopposed estrogen displays its activity by stimulating increased epithelial proliferation in the breasts and pelvic organs, by altering electrolyte and water metabolism to allow increased retention of extracellular tissue fluid, and by altering carbohydrate metabolism to permit increased sugar tolerance.

A new and striking finding in premenstrual tension is the hypoglycemia. This is clinically manifested by increased appetite or a craving for sweets, and a trembling of the hands described by patients as the "shakes." The psychic manifestations as well as the weakness and fatigue are also largely ascribed to the hypoglycemia. The anxiety neurosis, when present during the hypoglycemic state, is probably a subjective reaction to the profound weakness and fatigue.

The treatment of premenstrual tension is directed toward the correction of hormonal imbalance. Symptomatic treatment of the edema by salt restriction and administered diuretics, and of the hypoglycemia by dietary measures, are helpful adjunct measures.

The author is indebted to Dr. Frank Berner for the evaluation and interpretation of the psychiatric aspect of our patients; to Dr. George K. Higgins for the pathological studies; and to Dr. Thomas H. McGavack for his valuable comments and criticisms. The chorionic gonadotropin (A.P.L.) used in this study was donated by Ayerst, McKenna & Harrison, Ltd.

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CERVICAL CHANGES IN PREGNANCY, LABOR, AND THE PUERPERIUM*

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FEW reports have appeared in the literature describing the structural changes of the cervix in pregnancy, labor, and the puerperium. Gaifami[1] in 1910 described the microscopic changes of the portio vaginalis at varying stages of gestation. In this field, however, Stieve's[2] work has been outstanding. He described changes in the cervix and noted a central "spongy tissue" that included, in the main, hypertrophied endocervical glands. He was the first to make the striking observation that this glandular zone was completely denuded early in labor. In addition, he formulated a theory as to the effacement of the cervix during labor and its closure following delivery.

In 1931, Tarlo[3] corroborated Stieve's work and noted, in a few instances, decidual changes in the cervix. Revoltella[4] examined ninety-four cervices obtained from women during pregnancy, labor, and the puerperium. He was unable to confirm Stieve's observations of either marked vascular changes during pregnancy or the denudation of the glandular zone following labor. Decidual changes were present in 60 per cent of his material.

In an effort to substantiate Stieve's work, the following study was undertaken.

Material

We collected 51 cervical specimens from patients during pregnancy, labor, and the puerperium. Twenty-two were obtained by biopsy, 17 by autopsy, 6 by excision of polyps, 4 by hysterectomy, and 2 by amputation of the cervix.

The Cervix During Pregnancy

Thirteen cervical specimens were obtained at different stages of pregnancy. Data concerning this material is shown in Table I.

TABLE I. THE CERVIX DURING PREGNANCY

NUMBER	STAGE	METHOD OF OBTAINING SPECIMEN
1	4 weeks	Total hysterectomy
2	8 weeks	Total hysterectomy
3	3 months	Amputation
4	3 months	Subtotal hysterectomy
5	4 months	Excision of polyp
6	4 months	Excision of polyp
7	4 months	Excision of polyp
8	4-4½ months	Autopsy
9	5 months	Excision of polyp
10*	6½ months	Autopsy
11	7 months	Autopsy
12	8 months	Excision of polyp
13	8 months	Excision of polyp

*Uterus didelphys.

*Presented, by invitation, at a meeting of the New York Obstetrical Society, Nov. 8, 1949.

Changes in the Epithelial Lining.—

The squamous lining of the portio vaginalis showed varying degrees of hyperkeratosis and parakeratosis in all stages of pregnancy. Early, these were slight, more marked at term (Fig. 1), and apparently are synchronous with increasing estrogenic stimulation. This is in accord with the observations of Goldberger and Frank,[5] who demonstrated a progressive increase in estrin levels from the seventeenth week of pregnancy to term. However, the specimen obtained from a patient 7 months pregnant, with eclampsia, revealed an absence of cornification and an unusually thin lining (Fig. 2). Both alterations are the effect of subnormal estrin levels in toxemia as noted by Smith and Smith.[6] Schuman,[7] by vaginal smear, had demonstrated similar morphologic evidence in a case of pre-eclampsia.

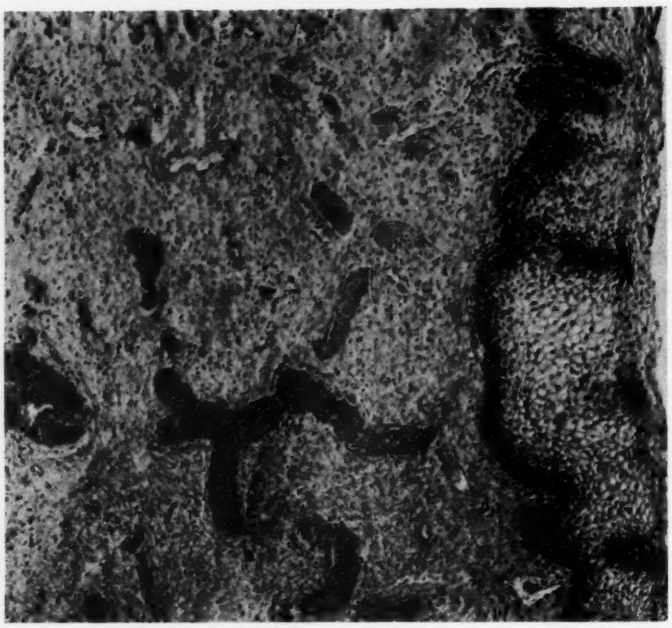

Fig. 1.—At 6½ months, normal pregnancy. The squamous lining is thick and cornified. The subepithelial stroma is edematous and the vessels are congested. (Magnification ×60.)

The endocervix was lined with tall secreting cells except in the specimen obtained from the patient dying from eclampsia. Here, focal areas showed low folds and the cells were only slightly active.

Glandular Changes.—

The cervical glands were lying in a loose, poorly supporting matrix of connective tissue. They were increased in size, in number, distended with mucus, and lined with tall secreting cells. Nine showed focal adenoma-like growth of the glands (Fig. 3) and when this was present, the surrounding stroma was unusually scant. Edema in the interglandular stroma was noted in all, yet varied in the same specimen. Stieve[2] contended that these changes were responsible for the glands and stroma being easily denuded during labor. In this connection, our evidence was as follows:

1. Hypertrophy and hyperplasia of the glands resulted in lessened stroma, and were accentuated where extreme glandular hyperplasia produced an adenoma-like growth.

2. The stroma consisted of mature connective tissue, and only occasionally were we impressed with its reversion to the embryonal state. Here, intense edema further contributed to weakening the supporting structure.

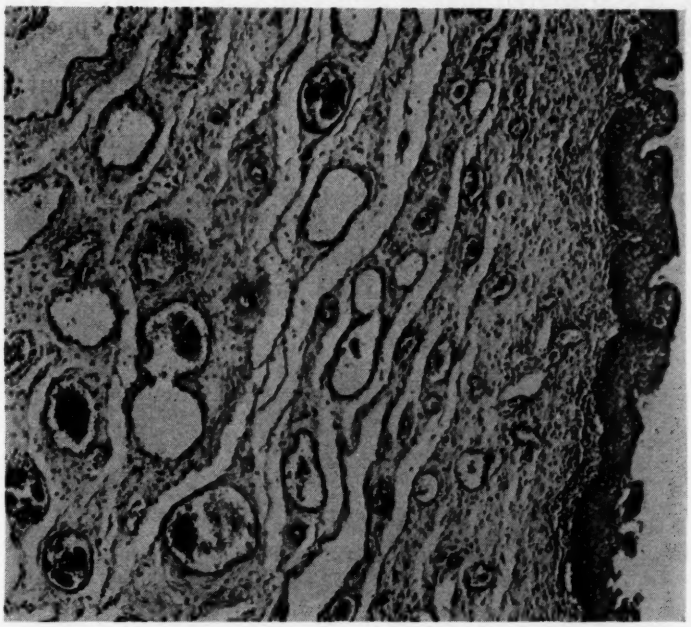

Fig. 2.—At 7 months, pregnancy complicated by eclampsia. The lining is thin and not cornified. The capillaries are sinusoidal in dimension and engorged. The fibrous stroma is markedly edematous. (Magnification ×60.)

Fig. 3.—At 6½ months, normal pregnancy. Section from the nonpregnant side of a uterus didelphys. The interglandular stroma is compressed while the glands are numerous, large and filled with mucus. (Magnification ×60.)

Three of the fourteen specimens showed typical decidual reactions (Fig. 4).

Changes in the Fibromuscular Wall.—

The cervix during pregnancy was comprised mainly of fibrous connective tissue and a few scattered muscle cells. In this, we corroborate the work of Danforth[8] and Schwarz and Woolf.[9] Both types of cells appeared larger than those in the nonpregnant cervix.

A marked increase in the size, number, and engorgement of the vessels was common. Extreme vascular changes in the outer layer were seen and such areas appeared transformed into a cavernlike structure. Large vessels were noted in the dense inner fibromuscular stroma, while in the loosely arranged outer zone they were thin walled, dilated, and more numerous.

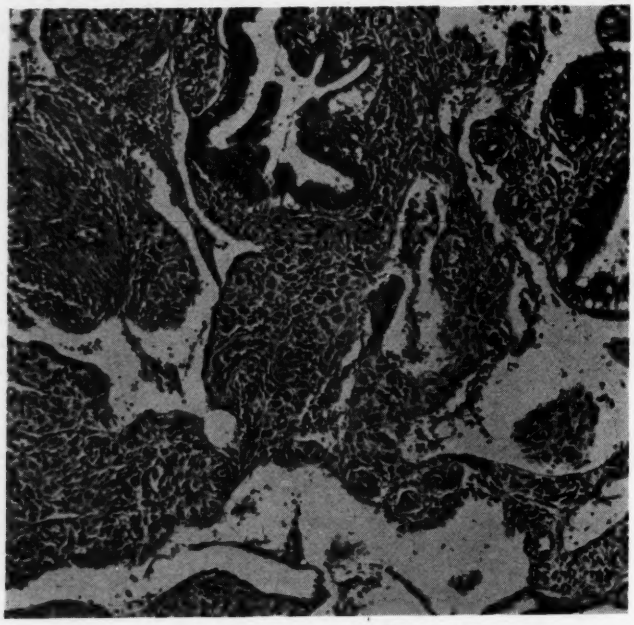

Fig. 4.—At 7 months, normal pregnancy, showing extensive decidual reaction about the glands.

The Cervix at Term

This group consisted of 23 specimens; 18 were biopsies, and all but one were removed vaginally immediately after delivery. Of the remaining 5, one was obtained at cesarean section and 3 by autopsy from patients who died four, eight, and twelve hours post partum. The remaining specimen was obtained by hysterectomy at the ninth month of pregnancy.

Changes in the Epithelial Lining.—

The squamous lining was present in 15, and showed some degree of hyperkeratosis and parakeratosis. In 9 they were marked, in 2 moderate, and slight in the remaining 2. A thin squamous lining was associated with subepithelial edema and/or hemorrhage in 5 specimens and it appeared that such findings might be responsible for this varied thickness. However, in 4 instances, the epithelium was thin even though these factors were absent.

The remaining two specimens were obtained from patients with severe toxemia coming to autopsy four and eight hours post partum. Unusual changes in the squamous epithelium were noted. In one, the lining was only two to four cells thick, the cells were transitional in type and thrown up into shallow tufts.

In the other, the lining was thinner than seen in specimens from nontoxemic patients. These findings were due to diminished hormonal stimulation and confirm the observation of those workers who have shown a marked decrease in estrogens when pregnancy is complicated by severe toxemia.

The endocervical lining was noted in 19 specimens. Six revealed a striking exaggeration in healing of erosions. A greater frequency has been noted by Fluhmann.[10] Marked hyperplasia of the cervical epithelium produced ingrowths of hyperchromatic cells sharply delimited by their basement membrane. Hofbauer[11] had described this previously. In two (Fig. 5), it was so extreme as to resemble an epithelioma.

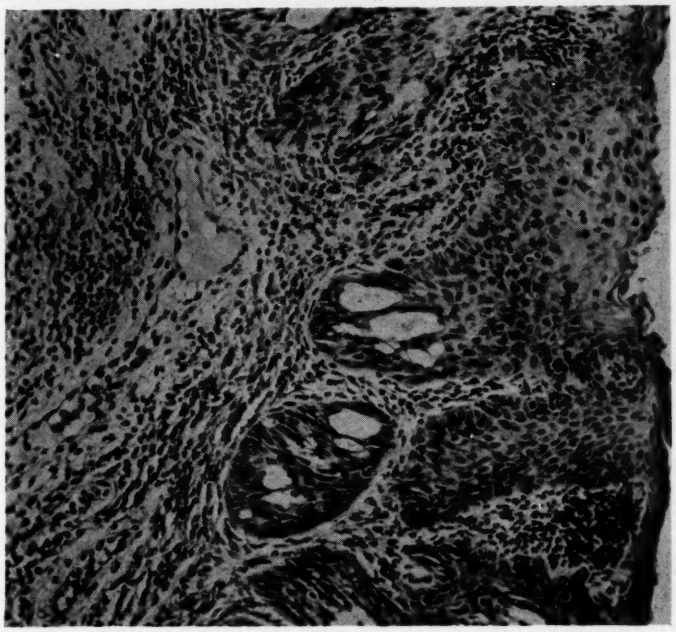

Fig. 5.—Normal pregnancy at term. Healing erosion where the epithelial proliferation is extreme and resembles carcinoma in situ. (Magnification ×165.)

Changes in the Cervical Glands.—

No glands were observed in 2 of the 23 specimens. In the remaining, they were scant in 7, moderately profuse in 8, and in 6 resembled an adenoma. Individual glands varied in size. Secretion was generally mucoid in character though in 5 a colloidlike type of material was observed. The latter was noted when the glands were profuse.

The interglandular stroma presented the following changes:

1. The stroma was scant, consisted of fibrous connective tissue whose component cell was generally increased in size.
2. Typical decidual reactions were seen in 4, while in 2 others, decidua-like changes were noted. When these were present the surrounding stroma was compact.
3. Edema and hemorrhage were present in all specimens, yet varied in degree.

In general, the outstanding features here were edema and a paucity of cells. Thus, it would appear that the glandular zone was poorly supported by connective tissue and theoretically the trauma of labor should cause it to become denuded.

Because of Stieve's claim that this occurs during labor, we paid particular attention to this area in all specimens obtained immediately after delivery. Twenty-two patients delivered vaginally. Six specimens were valueless because they failed to include a sufficient segment of endocervix for study. Of the remaining 16, 4 showed denudation (Fig. 6) while in 12 the endocervical lining and glands were observed to be partially or completely intact (Fig. 7).

From our observations, it is clear that neither denudation of the endocervical lining nor the glandular zone takes place in all instances.

Changes in the Fibromuscular Wall.—

All 23 specimens showed the fibromuscular wall to be composed mainly of fibrous connective tissue. Here, edema and hemorrhage were common, and, in 20, these findings were extreme, causing marked separation of the cells. Hemorrhage was absent in the biopsy obtained before the onset of labor.

The vascular zone was distinct in 22 specimens. The following observations were noted in all sections:

1. In this zone the capillaries were congested, increased in number, and were often sinusoidal in character.

2. After vaginal delivery, the fibromuscular wall presented moderate to extensive hemorrhage which presumably were due to rupture of the thin dilated capillaries during labor.

3. The arteries and the arterioles were engorged and both their intima and media were thickened.

The Postabortal Cervix

Examination of the 3 postabortal cervices yielded nothing pertinent to the study.

The Postpartum Cervix

There were 12 postpartum specimens. Two were obtained by biopsy, two and one-half and five days after delivery. The remaining 10 were obtained at autopsy. Two were from patients who died of peritonitis and lobar pneumonia.

Changes in the Epithelial Lining.—

The squamous lining was noted in 8 sections, and, for comparison, these were divided into two groups illustrated in Table II.

TABLE II. SQUAMOUS LINING, POST PARTUM

	DAYS POST PARTUM	CAUSE OF DEATH	HYPERKERATOSIS	PARAKERATOSIS
Nontoxemic.—				
1	4	Sepsis	0	Moderate
2	5	Sepsis	Slight	Slight
3	7	Sepsis	Marked	Marked
4	26	Sepsis	0	Slight
Toxemic.—				
1	1½	Eclampsia	0	0
2	1¼	Eclampsia	0	0
3	2	Pre-eclampsia	0	0
4	16	Eclampsia	0	0

Cornification in the squamous lining was lacking in all specimens acquired from patients with toxemia even though 3 had been obtained within forty-eight hours post partum (Fig. 8). This finding is in accord with our previous ob-

Fig. 6.—Immediately after a full-term delivery. Denudation of endocervical lining, glands, and stroma is complete. Hemorrhage and intense capillary congestion throughout the fibromuscular wall are marked. (Magnification ×60.)

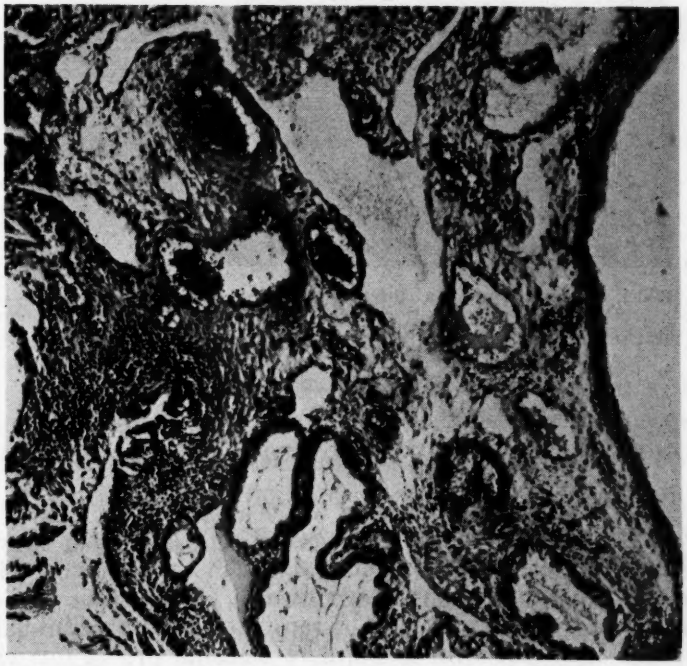

Fig. 7.—Immediately after a full-term delivery, showing intact endocervix in which there is slight hemorrhage and edema. (Magnification ×60.)

servation in the cervix obtained from the undelivered patient who died from eclampsia in the seventh month of pregnancy, and afforded further evidence of decreased estrogenic stimulation in severe toxemias.

Changes in the Cervical Glands.—

All specimens showed cervical glands and interglandular stroma. Typical pregnancy changes in the glands were noted in 3 specimens obtained during the first two and one-half days of the puerperium. On the other hand, a specimen obtained on the second day post partum from a patient dying from pre-eclampsia and decompensation failed to show such alterations. Regression of the glands was generally constant from the fourth to the sixtieth day of the puerperium.

The interglandular stroma was scant in three specimens obtained during the first two and one-half days of the puerperium. In the remaining 8, obtained from the fourth to the sixtieth day post partum, the stroma was compact except when associated pathological conditions caused edema, hemorrhage, or congestion.

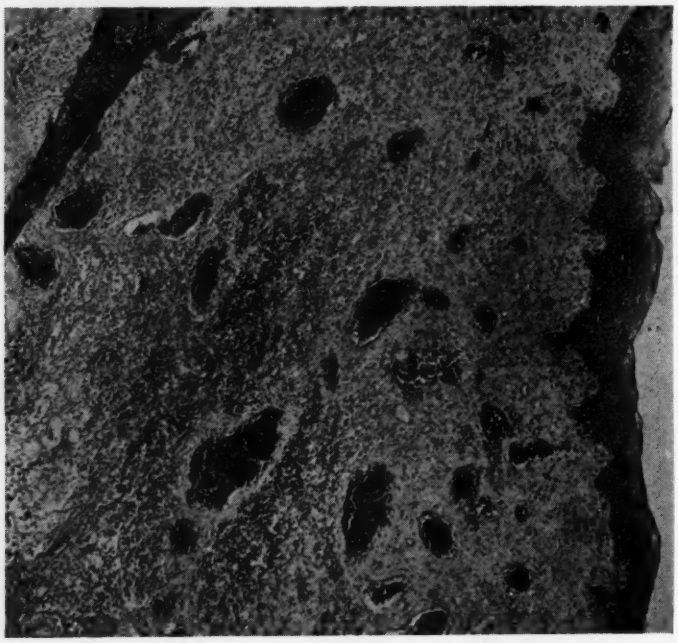

Fig. 8.—Death due to eclampsia thirty-six hours post partum. The squamous lining is thin and there is absence of cornification. The stroma is edematous and hemorrhagic. The capillaries are engorged. (Magnification ×60.)

Changes in the Fibromuscular Coat.—

All 12 specimens showed the fibromuscular wall. Here, edema, interstitial hemorrhages, and vascular changes were noted. Each will be described separately.

1. *Edema.*—All showed some edema which was most prominent immediately after delivery. At the end of the first week it had decreased except when concomitant pathological conditions accounted for its persistence. For example, two specimens were obtained on the seventh day post partum. In one, obtained post partum from a patient who died of sepsis, edema was minimal. The other was secured from a patient with a complete placenta previa for which cesarean section was done. Death was due to sepsis. Here, the intense edema throughout could be attributed to the previa.

2. *Hemorrhage.*—When labor or vaginal delivery had taken place, interstitial hemorrhages were marked early in the puerperium. Minimal or no hemorrhage was noted by the end of the first week.

3. *Vascular Changes.*—During the first week post partum the vascular hypertrophy and hyperplasia were similar to those seen in the at-term cervices. Moreover, they persisted longer than did either edema or hemorrhage. After the first week, concomitant pathological conditions such as phlebitis or placenta previa were responsible for the continued vascular hyperplasia.

We can, therefore, say that the postpartum specimens showed regression of pregnancy changes in the endocervical lining, stroma, and glands during the first four days of the puerperium. Variations appeared to be due either to abnormal hormonal effects or to associated pathology. Regression in the fibromuscular wall was marked after the first week.

Summary

A. Changes During Pregnancy.—

1. Epithelial proliferation was progressive. The squamous lining increased in thickness and became more cornified. The endocervical folds became taller, and the lining cells more active.

2. The glands appeared larger, more numerous, and their cells more active. Occasionally, hypertrophy and hyperplasia were extreme. In the glandular zone the stroma became edematous and sparse, and it would appear that there was lessened support for the glands.

3. The fibromuscular wall was comprised of fibrous connective tissue and a few scattered muscle cells. Vascularity became extreme, especially in the outer portion.

B. Changes After Vaginal Delivery.—

1. Edema throughout the organ was marked and extensive hemorrhages were noted.

2. The majority of the specimens show no evidence of denudation of the glandular area as described by Stieve.

C. Changes During the Puerperium.—

1. Regression of the lining, stroma, and glands began during the first four days of the puerperium.

2. Regressive changes in the fibromuscular wall were more marked after the first week.

D. Associated Changes.—

1. Decidual changes within the stroma were present in twelve specimens.

2. Marked epithelial proliferation of the endocervix occurs in healing erosions. In some sections they had a pseudo-malignant appearance. Since the microscopic picture closely resembles early carcinoma, an error in diagnosis may lead to an unnecessary radical operation for this benign condition.

3. In seven specimens obtained from patients who died of severe toxemia, the squamous lining was unusually thin and not cornified. This is indicative of decreased estrin levels in the blood which accompany late toxemia. It is pos-

sible, then, that either vaginal smears or biopsies from the squamous lining of the cervix might make one cognizant of an existing toxemia even before any subjective or objective signs are present.

We are greatly indebted to Mr. Steven Montes of the photographic department of the Long Island College of Medicine for the microphotographs.

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THE URINARY BLADDER DURING PARTURITION: A CONSIDERATION OF ITS LOCATION, INJURY, AND REPAIR

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PARTURITION, once the leading cause of vesicovaginal fistula,[1] now ranks behind surgery and radium insertion.[2] In the past two years an abnormal communication between vagina and lower urinary tract has occurred four times on the obstetrical service of the Beth Israel Hospital, an incidence of 0.08 per cent. Though uncommon, injury to the lower urinary tract remains a major complication of parturition. The purpose of this paper is: (1) to determine the location of the bladder at term and in labor; (2) to evaluate the practice of not catheterizing the bladder prior to instrumental delivery as a prophylactic measure against injury of the lower urinary tract; and (3) to suggest the advisability of immediate diagnosis and repair, should such an injury have occurred.

Case Reports

The first three cases are "primary" lacerations resulting directly from forceps maneuvers.

CASE 1.—L. S., 27-year-old primigravida. After thirty hours of first-stage and three hours of second-stage labor, the vertex was arrested at the level of the ischial spines in the left occipitoposterior position. Kielland forceps were applied and the fetus was delivered by rotation and extraction.

Examination immediately post partum revealed a laceration of the anterior vaginal wall, involving the floor of the bladder. Passage of a urethral catheter confirmed the impression of a large rent in the bladder. No repair was attempted. A self-retaining catheter was introduced through the urethra and the bladder was continuously drained into a bedside bottle for a period of two weeks. The patient was discharged three weeks post partum, trickling urine from the vagina.

Nine months later the patient was readmitted. A minute fistulous opening just anterior to the cervix was demonstrated. Repair was performed and the patient made an uneventful recovery. At the follow-up examination twelve weeks later, the patient had no complaints and the operative site was well healed.

CASE 2.—L. W., 29-year-old primigravida. Clinical impression of face presentation was confirmed by x-ray. Pelvic measurements were reported as "ample." After a first stage of twenty hours and a one-hour second stage, the fetus was delivered from left mentotransverse by rotation and extraction with the Kielland forceps.

Immediately after delivery, examination of the vagina revealed a central laceration of the bladder floor, 2.5 cm. in length. A Foley retention catheter was introduced, with drainage of gross blood. The bladder wall, fascia, and vaginal wall were repaired in three layers with interrupted sutures of 00 chromic catgut on an atraumatic needle.

Postpartum course was nonmorbid. The catheter was removed on the sixth day. There was no leakage of urine at any time. The patient was discharged on the ninth postpartum day. Follow-up at 6 weeks and 6 months revealed good vesical control and no urinary complaints.

CASE 3.—S. O., 24-year-old primigravida. After an eighteen-hour first stage and two and one-half hour second stage, vertex was arrested as left occipitotransverse in the midpelvis. The fetus was delivered with the Barton forceps.

Vaginal examination immediately after delivery revealed a laceration of the anterior wall, in the forepart of which a small rent of the urethral floor could be seen. Over a Foley type retention catheter the urethral and vaginal defects were closed by means of two layers of interrupted 00 chromic catgut.

The catheter was removed on the sixth postpartum day. The patient was continent except for dribbling of small quantities of urine on stress. Examination disclosed good healing of the repaired area. It was assumed that the leakage was due to incontinence on the basis of urethral scarring. On discharge on the ninth postpartum day, loss of urine had ceased entirely, and the patient has since been free of urinary symptoms.

The fourth case is one of "secondary" or "delayed" obstetric fistula, arising during the puerperium as the result of sloughing following prolonged compression.

CASE 4.—H. W., 20-year-old primigravida. After a fourteen-hour first stage and a five-hour second stage with midpelvic arrest as left occipitotransverse, the fetus was delivered by Barton forceps. Routine vaginal examination immediately post partum did not reveal a defect of the anterior vaginal wall. No leakage of urine occurred for three days. On the fourth postpartum day the patient was reported to have "voided involuntarily." Loss of urine was constant thereafter. Argyrol instilled into the bladder appeared in the vagina. A retention catheter was then inserted. However, the vesicovaginal fistula remained patent despite continuous drainage, and the patient was discharged unimproved on the fourteenth postpartum day. She did not return to the hospital.

Bladder Location at Term and in Labor; the Effect of Distention

In a consideration of obstetrical injury to the lower urinary tract, one should establish the location of the bladder in labor and assess the influence of distention. Most authorities agree that the bladder should be relatively empty throughout parturition and list many adverse effects of bladder distention during the three stages of labor and the immediate postpartum period.[3, 4] The standard textbooks stress the emptying of the bladder by catheterization as one of the conditions which must be fulfilled prior to forceps operations. Nevertheless, some obstetricians do not catheterize the bladder prior to delivery for the following reasons:

1. In the majority of cases the head is low and compressing the urethra against the symphysis at the time when catheterization is attempted. Forceful attempts result in trauma to the urethra with subsequent annoying urinary symptoms.
2. The bladder is drawn up out of the true pelvis with the developing lower uterine segment during the first stage of labor. By the time the second stage ensues, the bladder is no longer a pelvic organ and therefore cannot obstruct labor.
3. The distended bladder has real prophylactic value in that filling of the viscus elevates it out of the pelvis and beyond possible trauma from forceps maneuvers.

Tollefson and Russell[6] have written in support of the above view. They report that ". . . in the partially distended state the bladder becomes an abdominal organ rather than a pelvic one. It is held above and anterior to the

fetal presenting part, and consequently cannot be forced down in front of the head or breech as it delivers. Compression trauma to the bladder base is avoided. . . ."

From an anatomical viewpoint, considering the intimate fixation of bladder neck and urethra by means of pubocervical fascia and musculi pubovesicales[7] to the posteroinferior surface of the pubic body, it seems unlikely that the bladder can "float" up out of harm's way as suggested above. In order to determine if the above statements concerning the beneficial effect of bladder distention were true, the location of the bladder at term as well as during the first and second stages of labor was determined by means of x-ray cystogram studies.

TABLE I. LOCATION OF BLADDER DURING LAST TRIMESTER

	TOTAL HEIGHT (CM.)	PELVIC PORTION (CM.)	ABDOMINAL PORTION (CM.)
	11.6	1.0	10.6
	12.5	1.9	10.6
	10.9	2.0	8.9
	11.8	2.1	9.7
	11.6	1.9	9.7
	12.4	1.6	10.8
	11.5	1.9	9.6
	11.5	1.5	10.0
	10.4	1.3	9.1
	10.8	1.4	9.4
Average	11.5	1.7	9.8

One hundred twenty-five cubic centimeters of 4 per cent sodium iodide solution were used as the contrast medium. The ten films analyzed were lateral views of cases being studied for vaginal bleeding during the last trimester, selected only in the respect that placenta previa was eliminated by subsequent events. The superior border of the symphysis pubis was the dividing line between abdominal portion above and pelvic portion below. All films were corrected for distortion.

Results.—The bladder at or close to term is neither entirely a pelvic nor entirely an abdominal organ. There is a definite pelvic component and a definite abdominal component.

Location of the Bladder During Labor

Five patients were studied by means of x-ray cystograms during the first and second stages of labor. The active portion of labor was conducted under saddle-block anesthesia, thus obtaining the cooperation of the patient and insuring satisfactory films. The exposures for the first-stage films were made at 5 cm. of cervical dilatation and for the second-stage as soon as the patient had become fully dilated. All were vertex presentations. Three patients were primigravidas, two were parous women. The "full" bladder contained 300 c.c. of 4 per cent sodium iodide solution, the "empty" bladder, 40 c.c. The "width" of the bladder represents the greatest anteroposterior diameter in the lateral view. All films were corrected for distortion. Measurements are in centimeters.

Results.—The pelvic portion of the bladder is persistent throughout labor. The location of the bladder is not influenced by cervical dilatation or retraction. Distention of the bladder produced elevation of the vertex of the bladder and increase in the anteroposterior diameter but did not decrease the intrapelvic portion (Figs. 1 to 4).

Cystogram studies thus indicate that neither cervical dilatation and retraction nor partial distention can render the bladder totally an abdominal organ.

TABLE II

PATIENT	FIRST STAGE						SECOND STAGE					
	"FULL" BLADDER			"EMPTY" BLADDER			"FULL" BLADDER			"EMPTY" BLADDER		
	TOTAL HT.	PELVIC POR.	WIDTH	TOTAL HT.	PELVIC POR.	WIDTH	TOTAL HT.	PELVIC POR.	WIDTH	TOTAL HT.	PELVIC POR.	WIDTH
S. F.	13.5	1.4	5.5	10.5	1.0	5.0	16.5	1.0	7.0	11.0	2.0	4.0
G. T.	14.5	1.0	9.5	12.0	1.0	6.0	12.0	1.0	10.0	11.0	1.0	3.5
B. S.	13.2	2.0	6.5	6.8	2.5	3.0	14.2	2.3	6.5	7.0	2.8	3.0
L. C.	7.0	3.0	3.5	6.9	2.0	2.0	7.0	3.0	3.0	7.0	2.7	2.0
B. N.	10.1	2.0	5.5	7.1	2.0	3.9	11.0	1.0	6.1	7.5	1.2	2.6
Average	11.7	1.9	6.1	8.7	1.7	4.0	12.1	1.7	6.5	8.7	1.9	3.0

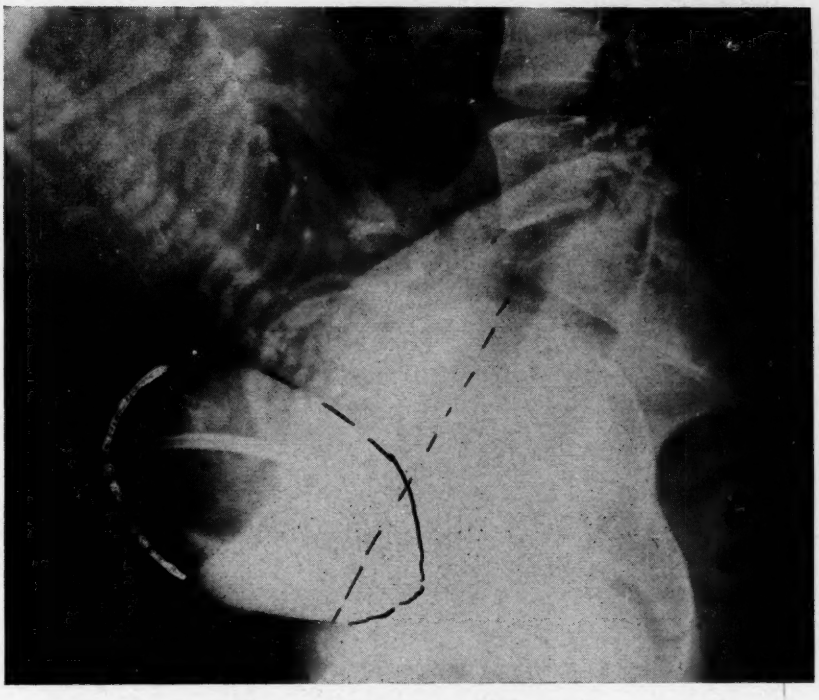

Fig. 1.—First stage, bladder full.

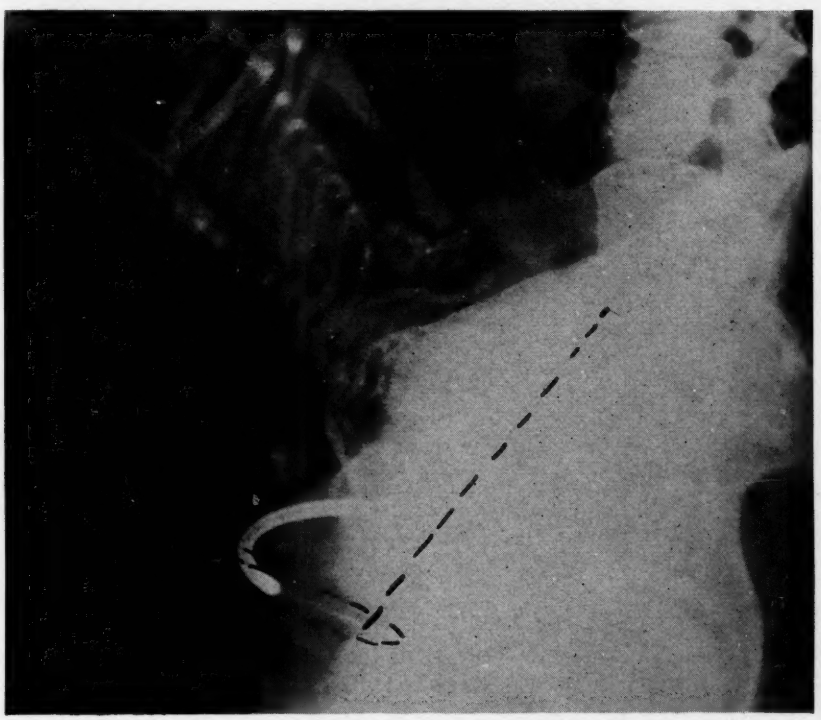

Fig. 2.—First stage, bladder empty.

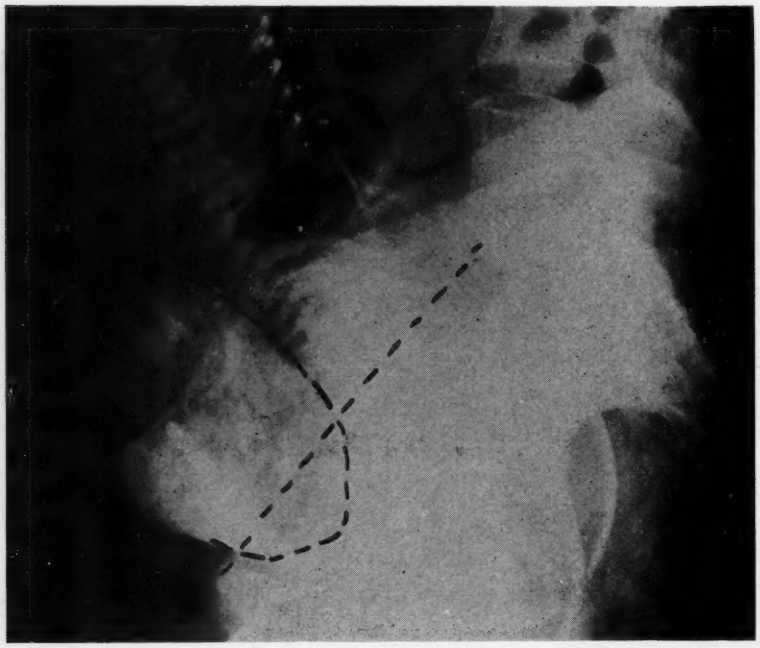

Fig. 3.—Second stage, bladder full.

Fig. 4.—Second stage, bladder empty.

Distention of the bladder, therefore, can produce no prophylactic effect against forceps compression or laceration by "floating" the bladder out of harm's way. It was apparent, during these studies, that fluid flowed freely from intrapelvic to abdominal portion, and vice versa, as a result of pressure changes. No "cushioning" effect could therefore be expected of the fluid within the bladder, since it is displaced from the zone of pressure.

Besides having no prophylactic value, bladder distention has definite adverse effects. It may interfere with descent and engagement.[8] A greater surface of distended bladder is exposed to potential trauma. (Anteroposterior films obtained in labor revealed that distention produced an increased transverse diameter of the bladder.) Should perforation occur, whether intra- or extraperitoneal, the dangers of urinary extravasation and peritonitis are greater with a full bladder than with an empty one.

We are led to conclude, therefore, that the dictum of routine catheterization prior to instrumental delivery should not be set aside. One exception to routine preforceps catheterization may arise when, as in outlet forceps delivery, the head is very low and exerting pressure on the urethra so that catheterization may be difficult or traumatic. However, this difficulty can usually be circumvented by utilizing a fine soft rubber catheter or by making slight upward pressure on the head.

In advocating routine catheterization, we do not mean to suggest that the presence of 100 c.c. of urine within the bladder during forceps delivery need produce any ill effect. However, we have had the repeated experience of obtaining large quantities of urine on catheterization prior to delivery when overdistention was not apparent clinically. The obstetrician who does not routinely catheterize may miss a distended bladder. The obstetrician who practices routine catheterization cannot do so.

Immediate Repair of Obstetrical Lacerations of the Lower Urinary Tract

The occurrence of an obstetric vesicovaginal or urethrovaginal fistula is the result of one or the other of two pathogenic processes: (1) Prolonged second-stage labor with compression, ischemia, and finally necrosis involving the lower urinary tract. As Phaneuf[1] pointed out, it was the "withholding of the forceps rather than their use" that was responsible for the disorder. Characteristically, the leakage of urine in these cases is delayed for several days, while the slough is being formed and separated (Case 4). (2) Forceps operations, producing lacerations of the anterior vaginal wall involving the bladder. The latter cases are characterized by immediate and constant vaginal urinary drainage. They may be recognized at the time of delivery by vaginal examination with visualization of the anterior wall, and by catheterization of the bladder, which is productive of blood rather than urine. If the defect is large, the catheter may be seen or felt in the vagina. In urethral laceration the passage of a catheter will establish the diagnosis.

In respect to treatment, the standard texts offer little assistance to the obstetrician who immediately recognizes the presence of a laceration in the anterior vaginal wall involving the urinary tract. General statements concerning the advisability of continuous bladder drainage by retention catheter and the necessity for delayed repair of fistulas are made. The impression one gains is that no treatment other than catheterization and, after many months, repair of the almost inevitable fistula is recommended. Such a regimen is suited to the "delayed" or "secondary" type of case, where no immediate diagnosis can be made, and where the necrotic, devitalized tissues provide a poor field for repair. However, it does not seem appropriate treatment for the "immediate" or "primary" type of case: the forceps laceration, in which diagnosis is readily established and the tissues are healthy. The availability of plasma, whole blood, the sulfonamides, and the antibiotics offers an opportunity for procedures which may, in the past, have been considered inadvisable because of shock and the probability of infection. War wounds of the bladder and urethra were treated by primary surgical repair whenever possible.[9] Counsellor[10] has stated that immediate repair of a bladder torn during delivery is practically always a

success. Two of the three cases presented above, in which immediate diagnosis could be and was made, were immediately repaired with excellent results. The other alternative consists of retention catheterization in the hope of spontaneous closure. This rarely occurs. Such a procedure usually condemns the patient to a period of invalidism and social difficulty of many months' duration, as well as to at least one, and frequently more, additional operative procedures. Therefore: (1) we advise the immediate diagnosis of obstetric laceration of the lower urinary tract by careful vaginal examination and catheterization in all cases of anterior laceration or difficult instrumental delivery. (2) We suggest immediate repair except when the condition of the patient is poor and measures against shock are the first consideration. Where a large defect difficult to bring together without tension or a lateral laceration which may involve the ureteral orifice is present, the repair may be postponed.

Summary and Conclusions

1. Four cases of obstetric injury of the lower urinary tract are presented.

2. Cystogram studies made at term and during the first and second stages of labor are charted. These reveal that the bladder has both abdominal and pelvic components and that neither cervical dilation, cervical retraction, nor moderate bladder distention raises the bladder out of the pelvis.

3. Distention of the bladder has no prophylactic value against injury of the lower urinary tract.

4. Routine catheterization prior to instrumental delivery is recommended.

5. Obstetric fistulas of the lower urinary tract are divided into (a) "primary" lacerations and (b) "secondary" sloughs.

6. The immediate diagnosis of obstetric bladder or urethral laceration can and should be made.

7. Immediate repair of such lacerations should be given consideration.

The authors wish to express their gratitude to Dr. Henry C. Falk for his valuable suggestions, to Dr. H. Schneider and Dr. E. Diamond for the use of their cases, and to Dr. Gertrude Marx for administering the saddle-block anesthesia.

Addendum

During the preparation of this paper, the study of Kantor, Miller, and Dunlap[8] appeared. These authors also concluded that location of the bladder base was not related to cervical dilatation and retraction. Malpas, Jeffcoate, and Lister (J. Obst. & Gynaec. Brit. Emp. **56**: 949, 1949), in a paper which appeared subsequently to submission of this paper for publication, have presented further confirmation.

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INTRACAVITARY RADIUM AT TIME OF VAGINAL PLASTIC OPERATION*

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MANY gynecologists have feared to use intracavitary radium for benign uterine disease at the time of repairing the vagina, although both procedures might be clearly indicated. Indeed, it is the recommended practice in many clinics not to carry out these procedures concurrently. Te Linde[1] definitely considers vaginal plastic operation a contraindication to the simultaneous use of radium. This restriction is apparently based on the fear that the tissue changes subsequent to radiation will hamper the healing powers of the repaired structures and, perhaps, will even cause wound breakdown. Rongy and Seley[2] state that their experience with the concomitant use of these operations is but recent. It seemed of value to analyze these possibilities by a critical study of the clinical course of patients in whom the dual therapy had been applied.

Material

This report comprises a group of 131 consecutive patients subjected to simultaneous repair of the vagina and intrauterine radium for benign disease at the Mount Sinai Hospital during the twenty-year period from Jan. 1, 1928, to Dec. 31, 1947. Of the 131 patients, 79 (60.3 per cent) were operated upon by one gynecologist, 22 (16.8 per cent) by a second, and the remaining 30 patients (22.9 per cent) by eight other gynecologic surgeons.

Age Incidence.—

Abnormal uterine bleeding during adolescence and the childbearing period is treated by a small dose of intracavitary radium only after other forms of therapy have failed. This study bears out the fact that most radium therapy is used near the close of the reproductive period or during the menopause. Of the 131 patients, 115 (88 per cent) were between 40 and 55 years of age. The youngest patient was 28 and the oldest 67. The average age of the entire group was 45.5 years.

Symptoms and Indications for Radium.—

All of the patients in this series required some form of vaginal plastic operation because of injuries incident to childbirth. The symptoms arising from them included sensations of dragging, bulging or swelling of the vagina, stress incontinence, and backache. In addition to symptoms arising from the birth canal, 108 (82.4 per cent) of the 131 patients presented some form of abnormal uterine bleeding. Of the 108 patients, 46 had menorrhagia, 36 metrorrhagia, and the remaining 26 patients menometrorrhagia. The indications for intracavitary radium were clear-cut in this group of 108 patients who presented uterine bleeding as a leading symptom. The remaining 23 patients (17.6 per cent) of the series showed no abnormal bleeding. Of these 23 women, 9 had uterine myomas, 4 had a diagnosis of "uterine fibrosis," and 10 patients required radium castration for varied reasons (Table I). One of the latter had

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an unusual indication for postpartum sterilization but was managed by means of radium castration. Her history follows:

I. H., a 42-year-old white woman, gravida v, para iv, who had multiple sclerosis as a result of encephalitis ten years before, was admitted at term in active labor. She was delivered spontaneously, without complication, of a living male infant. On the second postpartum day, the patient became irrational, climbed out of bed, and handled her entrusted baby carelessly. The neuropsychiatric consultant diagnosed the presence of mental deterioration secondary to organic brain disease (probably multiple sclerosis) and recommended sterilization. On the thirteenth postpartum day, the patient underwent amputation of the cervix, colpoplasty, and 2,400 mg. hr. of intracavitary radium. The postoperative course was uneventful, the patient being discharged on the fourteenth postoperative day.

Radium Dosage

Uterine hemorrhage may be regarded as being functional bleeding only in the absence of local or general lesions. This form of hemorrhage may occur in adolescence, during the childbearing age, or during the menopausal years. Radium was first used for the control of uterine bleeding secondary to myomas by Robert Abbe[3] in 1905. He postulated that the radium sealed the blood vessels of the bleeding endometrium by "occlusive inflammation." Since then, intracavitary radium has become a regular part of the gynecologist's armamentarium in the management of uterine bleeding arising from either benign neoplasms or disorders of endocrine origin, particularly when the childbearing function is no longer important.

TABLE I. INDICATIONS FOR INTRACAVITARY RADIUM APPLIED AT TIME OF COLPOPLASTY IN 131 PATIENTS

INDICATIONS	NUMBER OF PATIENTS	PERCENTAGE
Menorrhagia	46	35.1
Metrorrhagia	36	27.5
Menometrorrhagia	26	19.8
Fibromas without abnormal bleeding	9	6.9
"Uterine fibrosis" without abnormal bleeding	4	3.1
Radium castration	10	7.6

The action of radium on the endometrium and the ovaries is somewhat better understood now than when Abbe employed it. It is believed by many that the primary action of intracavitary radium is on the endometrium, producing a necrosis of the endometrial layer which results in its eventual replacement by newly formed connective tissue. Bleeding does not recur following such fibrosis because the endometrium is no longer a functioning tissue. The action of radium on the ovaries depends on its distance from the follicular apparatus which is very sensitive to the emitted rays. If the size of the uterus permits, intracavitary radium destroys the follicular function of the ovaries, resulting in atrophy and inducing castration effects. Thus, radium makes itself felt first on the endometrium, controlling hemorrhage by obliteration of the arterial tree. This may or may not be permanent, varying with the size of the dose. In longer exposures or higher dosage, an effect also occurs on the ovary, resulting in either temporary or permanent castration, depending on the proximity of the radium to the ovaries. Radiotherapists[4] agree that about 800 mg. hr. are required to produce permanent amenorrhea at the beginning of the fourth decade of life, but exceptional responses are encountered with smaller doses. The castrating dose is considered to be about 1,800 mg. hr.

In this series, the smallest dose was 400 mg. hr. and the largest 3,600. Fig. 1 shows the range of doses in the 131 patients for the twenty-year period. Fifty-three patients (40.6 per cent) received 1,200 mg. hr. and 62 (47.2 per cent) received 2,400.

It is interesting to note that the optimum dosage for castration during the first decade covered by this report, 1928 to 1937, was considered to be 1,200 mg. hr. Thus, of the 53 patients treated during this period, 38 (71 per cent) received 1,200 mg. hr. and 6 (11.3 per cent) received 2,400. During the second decade, 1938 to 1947, however, 2,400 mg. hr. was considered a more suitable dosage. Of the 78 patients irradiated during that period, 15 (19.2 per cent) received 1,200 mg. hr. and 56 (72 per cent) received 2,400 mg. hr. (Fig. 2).

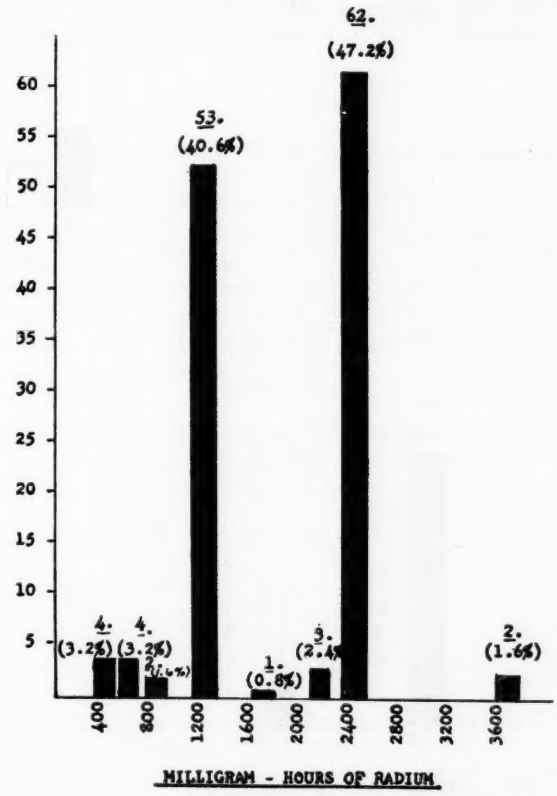

Fig. 1.—Intracavitary dosage of radium in 131 patients at time of colpoplasty. Number of patients indicated in vertical column.

Anatomic Derangements and Indications for Colpoplasty

Childbirth is undoubtedly the greatest cause of anatomic derangements of the vagina necessitating plastic operations. In addition to the altered morphology of the supporting structures, childbirth is also often responsible for chronic disease of the cervix. Analysis of the anatomic changes and pathologic conditions found in the 131 patients of this series reaffirmed the importance of childbirth as an etiological factor. These conditions of the lower birth canal were the indications for the colpoplasty performed, in one form or another, in each of the 131 patients. As shown in Table II, cystocele and rectocele were,

TABLE II. DEFECTS OF VAGINAL SUPPORT IN 131 PATIENTS REQUIRING COLPOPLASTY

ANATOMIC DERANGEMENTS	NUMBER OF PATIENTS	PERCENTAGE
Cystocele and rectocele	78	59.5
Rectocele	30	23.0
Cystocele	11	8.3
Cystocele, urethrocele, and rectocele	5	3.8
Cystocele and urethrocele	4	3.2
Urethrocele	2	1.5
Urethrocele and rectocele	1	0.7

as would be anticipated, the most common diagnosis. There were, in addition to the fault of vaginal support, lesions of the cervix and myomas of the uterus encountered. Of the 131 patients, 103 (78.5 per cent) showed grossly recognizable cervicitis, and 63 (48 per cent) evidenced some degree of uterine enlargement.

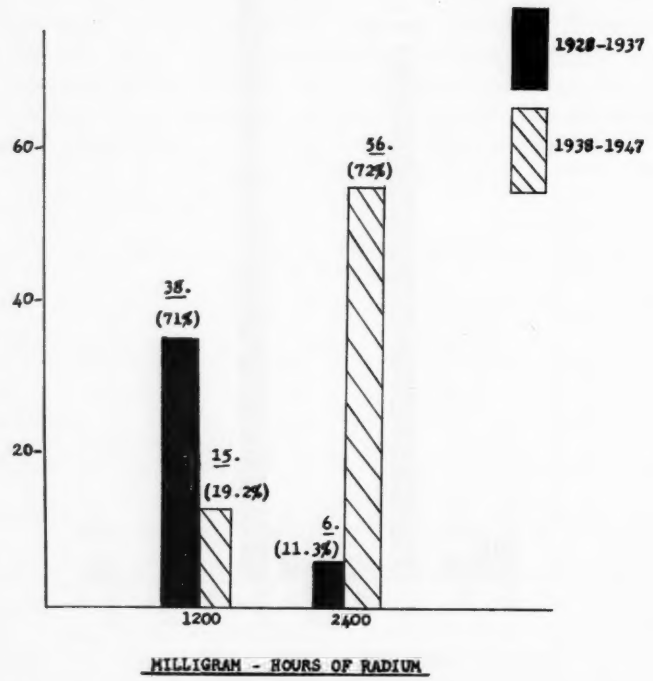

Fig. 2.—Comparison of castrating dosage of intracavitary radium by decades of study. Note reversal from lower to higher dose. Number of patients indicated in vertical column.

Operative Procedures

As shown in Table III, each patient in this series underwent cervical dilatation and uterine curettage as the preliminary part of the vaginal operation. Ninety-eight patients (72.5 per cent) required some additional surgical treatment of the cervix, as follows: 86 patients (66 per cent) had an amputation of the cervix, 6 (4.6 per cent) cauterization, 4 (3.2 per cent) cervical biopsy, 1 (0.7 per cent) conization, and 1 (0.7 per cent) a polypectomy.

The vaginal plastic procedures employed in this series are shown in Table IV.

TABLE III. TREATMENT OF CERVIX AT TIME OF COLPOPLASTY IN 131 PATIENTS

OPERATIVE PROCEDURE ON CERVIX	NUMBER OF PATIENTS	PERCENTAGE
Dilatation preceding curettage	131	100.0
Amputation	86	66.0
Cauterization	6	4.6
Biopsy	4	3.2
Conization	1	0.7
Polypectomy	1	0.7

TABLE IV. VAGINAL PLASTIC PROCEDURES IN 131 PATIENTS SIMULTANEOUSLY SUBJECTED TO INTRACAVITARY RADIUM IRRADIATION

OPERATION	NUMBER OF PATIENTS	PERCENTAGE
Anterior and posterior colporrhaphy	73	55.9
Posterior colporrhaphy	36	37.4
Anterior colporrhaphy	22	16.7

Pathologic Conditions of Cervix and Endometrium

All of the cervical specimens were subjected to the careful scrutiny of the hospital's pathologist (Table V). His histologic examination of the 98 cervical specimens demonstrated the presence of chronic cystic cervicitis in 86 (87.6 per cent), hyperplasia of the squamous epithelium in 17 (17.3 per cent), endocervical polyp in 8 (8.1 per cent), benign metaplasia of the endocervical epithelium in 4 (4.0 per cent), and cervical endometriosis in 1 (1.0 per cent). No malignant lesions were found.

TABLE V. CERVICAL PATHOLOGY FOUND IN 98 PATIENTS AT TIME OF COLPOPLASTY AND INTRACAVITARY RADIUM IRRADIATION

PATHOLOGIC CONDITIONS OF CERVIX	NUMBER OF PATIENTS	PERCENTAGE
Chronic cystic disease	86	87.6
Hyperplasia of squamous epithelium	17	17.3
Endocervical polyp	8	8.1
Benign metaplasia	4	4.0
Endometriosis	1	1.0

TABLE VI. ENDOMETRIAL FINDINGS IN 76 PATIENTS SUBJECTED TO COLPOPLASTY AND INTRACAVITARY RADIUM APPLICATION

PATHOLOGIC CONDITIONS	NUMBER OF PATIENTS	PERCENTAGE
Hyperplasia	55	72.5
Atrophic endometrium	14	18.5
Submucous myoma	3	3.9
Products of conception	2	2.6
Early adenocarcinoma	1	1.3
Endometritis (postabortal?)	1	1.3

Unfortunately, not all of the endometrial tissue removed by preliminary curettage was histologically studied. However, the findings in 76 of the 131 patients, whose endometrium was examined, are interesting for several reasons (Table VI). It is, for instance, noteworthy that only a single adenocarcinoma was found, although it must have been the theoretical object of the curettage in all of the patients presenting abnormal uterine bleeding (Table I). It is

also interesting that the intracavitary radium applied in the three patients subsequently shown by the pathologist's report to have been recently pregnant evoked no untoward reaction. It may be presumed, however, that the radium would not have been placed in the uterus had the recent conception been apparent to the operator at the time of the curettage. Finally, the incidence of hyperplasia encountered in the 76 specimens of endometrium (72.5 per cent) approximates the one to be anticipated in any group of premenopausal women experiencing abnormal uterine bleeding.

Immediate Postoperative Complications

In the present series of 131 patients subjected concomitantly to colpoplasty and intrauterine radium therapy there was no major postoperative complication. The minor surgical sequelae encountered in 49 patients (36.4 per cent) were the usual local difficulties which beset patients following vaginal plastic procedures when radium is *not* used. As shown in Table VII, 24 patients (18.4 per cent) developed asymptomatic pyuria (the finding of 8 or more white blood cells per high power field in the catheterized specimen). Only 17 (13.0 per cent) of the group experienced some difficulty in spontaneous voiding, and 2 patients (1.5 per cent) had moderate vaginal bleeding controlled without any form of operative interference. No gross morbidity was noted in the entire series.

TABLE VII. IMMEDIATE POSTOPERATIVE COMPLICATIONS FOLLOWING COLFOPLASTY AND INTRACAVITARY RADIUM THERAPY IN 131 PATIENTS

COMPLICATION	NUMBER OF PATIENTS	PERCENTAGE
Asymptomatic pyuria	24	18.4
Difficulty in voiding	17	13.0
Vaginal bleeding	2	1.5
Thrombotic hemorrhoids	1	0.7
Rectal pain	1	0.7
Phlebitis	1	0.7
Diarrhea	1	0.7
Perineal wound infection	1	0.7
Totals	49	36.4

Results

The immediate results were good in all patients. No wound failed to heal properly. It was possible to secure adequate follow-up reports varying from one to twenty years in 107 of the 131 patients (81.8 per cent). Of the 107 patients, 101 (94.5 per cent) attained an excellent anatomic and physiologic result. The final outcome in 5 patients (4.7 per cent) was fair, 2 of these having a moderate recurrence of cystocele, 2 of cystocele and rectocele, and 1 of rectocele. The remaining patient (0.9 per cent) had a poor anatomic result which was attributed to faulty technique. She had received but 400 mg. hr. of radium for "uterine fibrosis." This small dose seems to exonerate the radium as being contributory to the failure.

The patient whose endometrium showed early adenocarcinoma received 2,400 mg. hr. of radium and underwent total hysterectomy and bilateral salpingo-oophorectomy six weeks later. Examination of the uterus showed no evidence of the previously reported carcinoma.

Of the 107 adequately followed patients, 100 had 1,200 or more milligram hours of intrauterine radium. Of these 100 patients, only one had any form of vaginal bleeding after the third postirradiation period and that was estrogen induced.

Corscaden[5] has implied that endometrium which bleeds abnormally prior to the menopause is predisposed to the subsequent development of carcinoma. The question concerning an alleged carcinogenic effect of intracavitary radium when employed for benign uterine disease cannot yet be answered.[6] In this small series, 108 patients had had radium therapy because of abnormal uterine bleeding. It was possible to follow 89 of these women. Not one has developed endometrial carcinoma to date. One patient who had received 1,200 mg. hr. of radium for menometrorrhagia developed papillary adenocarcinoma of the ovary fifteen years later. It is also interesting to note that another patient later developed carcinoma of the colon.

Summary and Conclusions

A critical analysis of 131 consecutive patients in each of whom vaginal plastic operation was done in conjunction with the use of intracavitary radium for benign uterine disease revealed no contraindication to such dual therapy. There was no instance of delayed healing or wound breakdown. All complications were those of the immediate postoperative period, chiefly minor difficulties which are frequent sequelae to vaginal plastic operation without radium. The freedom of this group of patients from inflammatory reactions is all the more noteworthy when it is recalled that 78.5 per cent showed some form of chronic cervicitis.

The majority of patients (82.4 per cent) who received radium did so because of some form of abnormal uterine bleeding. The objective in general was to achieve cessation of bleeding. Despite a change in the considered optimum dosage for radium-induced menopause from 1,200 mg. hr. to 2,400 mg. hr. over a period of years, the analysis revealed that 1,200 mg. hr. proved adequate in all cases. The only patient who exhibited postirradiation uterine bleeding was one who had been given repeated doses of estrogenic substance.

To date, no patient in this series has developed carcinoma of the endometrium during one to twenty years following the intrauterine use of radium for benign disease. One patient developed papillary adenocarcinoma of the ovaries fifteen years later.

This study reveals no reason to avoid the use of intracavitary irradiation at the time of performing any type of vaginal colpoplasty.

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Discussion

DR. S. LEON ISRAEL.—Dr. Weber has supplied definitive information on a subject lightly covered by factual statistics. The objective of the 131 case records was to find justification for the expressed fear of some gynecologists of combining vaginal plastic procedures and the intrauterine application of radium. On this score, his study eloquently denies the basis for such fear. The lack of morbidity, the high rate of satisfactory ana-

tomic results, and the effective control of abnormal uterine bleeding bespeak the safety of the surgical combination. Not an objective of Dr. Weber's analysis because of the relatively small number of patients but, nevertheless, inescapably of great moment is the question raised concerning the wisdom of employing intracavitary radium for benign conditions of the uterus between the years 40 and 55. Eighty-eight per cent of the women in the present series were of this age-group. During these menstrually eventful years, women with amenorrhea may safely be neglected but those who bleed abnormally must be treated. Our attitude regarding such treatment has perforce undergone some change during the twenty years encompassed by Dr. Weber's report. Today, having excluded the presence of cancer and having equally failed to control the bleeding by means of curettage alone, the gynecologist faced with such uterine dysfunction must choose between radium or x-ray irradiation and abdominal or vaginal hysterectomy. If we accept the warning of Novak concerning the precursive nature of menopausal hyperplasia of the endometrium, then any procedure aimed at stemming that process is of value—either radium or surgery will accomplish this. The current attitude of pessimism concerning radiation therapy for benign uterine dysfunction does not seem justified by the good results attained in well-selected patients. On the other hand, if we duly regard Corscaden's experience concerning the heightened incidence of endometrial carcinoma following radium irradiation, we are impelled to embark upon a course of widespread prophylactic hysterectomy. This schism of therapy will not be resolved this year or next but the eventual solution will result from analytical reviews similar to the one presented here by Dr. Weber.

COAGULATION DEFECTS ASSOCIATED WITH PREMATURE SEPARATION OF THE NORMALLY IMPLANTED PLACENTA*

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HEMORRHAGE remains one of the major causes of obstetrical deaths in spite of the availability of blood banks and transfusion facilities. This suggests that loss of blood in obstetrical hemorrhage may be due to causes which are still not recognized. For many years it has been clinically evident that exsanguination may occur in certain patients with premature separation of the placenta. In nearly all cases, the degree of placental separation is mild and the condition does not carry an unusual risk. The remaining cases exhibit a severe degree of separation and the maternal mortality in this group continues to be the highest of any complication of pregnancy.

In 1901 DeLee[1] postulated a hemophilia-like condition in the blood of a patient dying with uteroplacental apoplexy. Williams[2] thought that the pathologic lesions produced by the venom of certain snakes resembled the hemorrhagic lesions of placental separation. In reviewing a group of patients with uteroplacental apoplexy, Willson[3] in 1922 stated, "nor are clinical observations lacking that an inhibition of coagulation may be present." Dieckmann[4] in 1936 described decreased fibrinogen concentrations in several patients with severe premature separation. Recently Moloney[5] reported a case of afibrinogenemia in pregnancy.

A study was recently begun at the Boston Lying-in Hospital to determine possible alterations in the coagulation mechanism in normal and abnormal pregnancy. Preliminary observations have revealed that there were alterations in certain cases of severe premature separation of the placenta. In the investigation of this group an attempt has been made to determine (1) the nature of the blood changes, (2) whether these changes precede or follow separation, (3) whether these changes are influenced by the degree of separation, and (4) whether possible coagulation difficulties become intensified during the time that the patient remains undelivered. The pertinent clinical and laboratory data from three cases of severe premature separation of the placenta are presented. This communication is concerned with an attempt to answer the foregoing questions.

Methods

1. The clotting test was performed according to the Lee-White method.[6]
2. The estimation of the bleeding time utilized the ear-lobe puncture technique.[7]
3. The presence of a fibrinolysin was determined by three methods: (a) gross clot dissolution,[8] (b) the dilution technique of MacFarlane,[9] and (c) the concentration technique of Smith and Smith.[10]

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4. Platelet counts were performed and an estimation was made of clot retraction to determine the adequacy of platelets.[11]

5. Prothrombin activity was determined by the one-stage method of Quick[12] using standardized thromboplastin.[13]

6. Plasma fibrinogen was determined by the micro-Kjeldahl method.[14]

7. Tests for anticoagulants, including those of the heparin-like group, were performed.[15]

Case Reports

CASE 1.—Mrs. McH. was a 25-year-old gravida ii, para i, Rh negative without anti-Rh agglutinins. Her expected date of confinement was May 4, 1949. She was referred to the toxemia clinic at her first visit to the hospital when two and one-half months pregnant because of a blood pressure of 160/102.

Her past obstetrical history included one previous pregnancy in 1947 that was complicated by severe pre-eclampsia. In the seventh month she was hospitalized because of increasing proteinuria and hypertension and a cesarean section was done because of fulminating pre-eclampsia. There was evidence of a moderate degree of placental separation. The patient had a normal convalescence and was discharged from the hospital with her infant, both in good condition.

During the seventh month of the present pregnancy, on Feb. 21, 1949, the patient was admitted for study of persistent hypertension. The intravenous pyelogram and the daily urine examinations were normal but the phenolsulfonphthalein excretion was 25 per cent in one hour. The bleeding time was 2 minutes. The clotting time was 12 minutes and clot stability and retraction were normal with no evidence of a fibrinolysin. The blood fibrinogen was 274 mg. per cent, the prothrombin activity 100 per cent. The patient was discharged on the sixth day after entrance with a blood pressure of 150/100 to be followed in the toxemia clinic.

The patient returned by ambulance 30 hours after discharge. She had been awakened 3 hours previously by severe, constant pain and exquisite tenderness in the abdomen. Physical examination on entrance showed a patient who was pale and apprehensive with a blood pressure of 136/100 and a pulse of 100. There was no vaginal bleeding and the fetal membranes were intact. The fundus of the uterus was boardlike and very tender to palpation; in addition it appeared larger in size than when observed a few days previously. The cervix was firm and closed. The fetal heartbeat was heard at 200 in the left lower quadrant. A diagnosis of premature separation of the placenta was made and immediate cesarean section was done under ether anesthesia. At operation the peritoneal cavity contained a moderate amount of serosanguineous fluid. The uterine scar was intact but the uterus itself was mottled by subserosal hemorrhages and there was marked evidence of myometrial infiltration with blood. Fully 50 per cent of the placenta was separated and the uterine cavity was filled with 600 c.c. of blood clot. The patient received 1,500 c.c. of blood during and immediately following the operation and did well thereafter, with no unusual bleeding. The pathologic report confirmed the diagnosis of toxic separation of the placenta.

Laboratory work on entrance showed the urine to contain 3 plus albumin, white cells, bacteria, and casts. The hematocrit was 36 per cent. The red-cell count was 4.1 million, and the hemoglobin 11.2 Gm. per cent. The clotting time was 5 minutes. The clot retraction was normal. There was complete lysis of the incubated clot in six hours. The prothrombin activity was 50 per cent and the fibrinogen 150 mg. per cent. There was no evidence of a circulating anticoagulant.

On March 1, 1949, three days post partum, repeat studies showed a stable blood clot with no evidence of a fibrinolysin. The fibrinogen was 356 mg. per cent and the prothrombin activity 90 per cent. The patient had a normal postpartum course.

CASE 2.—Mrs. G. was a 27-year-old gravida i, para 0, whose expected date of confinement was June 12, 1949. Her prenatal course was normal until she was admitted on March 12, twenty-seven weeks pregnant. She gave a history of continuous lower abdominal pain

of four hours' duration. This pain was sudden in onset and increasing in intensity. One-half hour prior to entrance, the patient passed a small quantity of bright red blood vaginally. The patient was not aware of fetal movements for twelve hours. Physical examination on entrance showed a pale, distressed patient with a blood pressure of 116/80, a pulse of 64, and a uterus that was boardlike and very tender. The fundus of the uterus was 10 cm. below the xiphoid. No fetal heartbeat was heard. The membranes were intact. The diagnosis was severe premature separation of the placenta.

On admission, the laboratory examination showed the urine to be normal. The red cell count was 3.4 million and the hemoglobin 10 Gm. per cent. The bleeding time was 2 minutes. The clotting time was 6 minutes and the clot that formed initially was about 30 per cent normal clot size; this clot dissolved upon incubation and in 4 hours it was only 10 per cent of normal clot size. A circulating fibrinolysin was detected. This lysin was still demonstrable four weeks later in plasma that was preserved in the frozen state. The platelet count was 200,000. Fibrinogen was 125 mg. per cent and the prothrombin activity was 80 per cent. There was no evidence of a circulating anticoagulant.

Soon after admission a vaginal examination was made under double-setup precautions to determine the cause of the bleeding. The cervix was found to be 3 cm. long and firm. The examining finger could barely be introduced through the cervix. There was no evidence of placenta previa or external hemorrhage. The membranes were artificially ruptured.

Five hours after rupture of the membranes, labor had not ensued. There was only minimal staining. Pituitrin was started in one minim doses intramuscularly every half hour. Blood studies at this time showed a bleeding time of 3 minutes. The clotting time was 8 minutes. The clot that formed was still small but no lysis followed incubation and no fibrinolysin was present at this time or in subsequent samples. The fibrinogen was 125 mg. per cent and the prothrombin activity was 40 per cent. There was no evidence of an anticoagulant.

Thirteen hours after rupture of the membranes, blood studies showed no change from the previous values. The patient's condition remained good with no external bleeding and with a normal pulse and blood pressure. No signs of labor were present.

Twenty hours after rupture of the membranes a sterile pelvic examination showed the cervix to be 2 cm. dilated and well effaced. A fetal foot was found to be presenting at the internal os of the cervix. This was brought into the vagina and a small weight attached. Fibrinogen had increased to 213 mg. per cent while other values remained unchanged.

At thirty hours after rupture of the membranes the patient was delivered of a 2 pound, 8 ounce stillborn fetus and an apparently completely separated placenta. There were also 500 c.c. of clotted blood. No active bleeding was present. Determinations made on venous blood at the time of delivery showed a fibrinogen of 231 mg. per cent, and a prothrombin activity of 30 per cent. A 500 c.c. transfusion was given immediately after delivery. Two hours after delivery and transfusion the fibrinogen was 283 mg. per cent, the prothrombin activity was 100 per cent, and a large stable clot formed. The patient had a normal postpartum course.

CASE 3.—Mrs. C. was a 34-year-old unregistered gravida viii, para vii, whose expected date of confinement was Aug. 8, 1949. She was admitted on July 28, 1949, at 12:15 P.M. because of severe abdominal pain and marked vaginal bleeding of four hours' duration. Nothing was known of her prenatal course since she had visited her doctor only once during this pregnancy. Her past obstetrical history included seven normal pregnancies. There was no past history of toxemia, kidney disease, or hypertension.

On entrance the patient was pale and sweating and in obvious shock. The blood pressure was 80/60 and the pulse 110. The fundus of the uterus was 2 cm. below the xiphoid, tense and extremely tender. The membranes were intact, and there was moderate vaginal staining.

The urine showed a 4 plus albumin with a negative sediment. The red-cell count was 2.5 million and the hemoglobin 7.7 Gm. The clotting time was 3 minutes. The clot that formed was grossly adequate and showed no evidence of lysis after 24 hours of incubation. The MacFarlane test was negative for fibrinolysin. The fibrinogen was 212 mg. per cent and the prothrombin activity 80 per cent.

Fifteen hundred c.c. of blood were given rapidly. One-half hour after transfusion, a double-setup examination was done. Pelvic examination showed a partly effaced cervix 4 cm. dilated. There was no evidence of placenta previa. The membranes were artificially ruptured. Shortly thereafter the patient went into active labor. At the time of vaginal examination and prior to rupture of the membranes, the blood studies were repeated. The blood gelled in 6 minutes and 15 minutes later the blood was once again completely liquid. Fibrinogen was absent from this patient's blood since none could be determined quantitatively. No plasma clot could be formed with thrombin or calcium chloride. A lysin which destroyed fibrin clot in the test tube was present in the plasma of this patient at this time.

The patient remained in good condition during labor without evidence of external bleeding. Eighty minutes after artificial rupture of the membranes, the patient spontaneously delivered a dead fetus; an apparently completely separated placenta came away 2 minutes later together with 1,500 c.c. of old blood clot. In spite of a well-contracted uterus, the patient lost 500 c.c. of blood during the first 15 minutes after delivery. A portion of this blood which ran on the floor showed no signs of clotting during 1 hour of observation. Fibrinogen solution was started coincident with delivery and by 20 minutes after delivery 1,000 mg. of fibrinogen had been given, and for the first time clots appeared at the vulva. Within 30 minutes a total of 2,400 mg. of fibrinogen had been administered and bleeding had ceased. Blood drawn at the end of fibrinogen administration produced a stable clot of good size in the test tube. This clot remained unchanged after 24 hours of incubation, and there was no evidence of a fibrinolysin. At this time the fibrinogen was 188 mg. per cent and the prothrombin activity 18 per cent.

The patient was in good condition after fibrinogen therapy with a blood pressure of 170/100 and a pulse of 85. Her convalescence was uneventful thereafter. On the second postpartum day she was given an additional 1,000 c.c. of blood because the red-cell count was 1.9 million and the hemoglobin was 6.3 Gm. On the fourth postpartum day the clotting time was 7 minutes, the prothrombin activity 100 per cent, fibrinogen 343 mg. per cent, and there was no evidence of a lysin or anticoagulant.

The findings in Mrs. McH. indicate normal blood components one week before separation. Three hours after separation in the presence of intact membranes and a Couvelaire uterus, fibrinogen and prothrombin were reduced to 50 per cent of their previous values and a circulating fibrinolysin had appeared. These changes were not severe enough to enter an incoagulable range. Three days after delivery coagulation components were again normal (Fig. 1).

In Fig. 2 are illustrated the changes occurring in the coagulation components of Mrs. G. While there was no observation of the blood of this patient prior to hospital entrance, the initial fibrinogen (125 mg. per cent) four hours after onset of symptoms was approximately one-third the average value observed in normal pregnancy. This value did not fall after artificial rupture of the membranes; on the contrary a spontaneous rise in fibrinogen started at 20 hours after this procedure. Because transfusion was not needed during labor, it was possible to secure multiple observations prior to delivery. Fibrinogen values did not decrease. Transfusion given at delivery produced some increase in the fibrinogen level. After placental separation the prothrombin activity deteriorated from an initial value of 80 per cent to 30 per cent at the time of delivery. This approaches a hemorrhagic range. The marked improvement in prothrombin activity following transfusion at the time of delivery can be readily observed. It is noted that a circulating fibrinolysin which was present before artificial rupture of the membranes could not be demonstrated thereafter.

The coagulation mechanism was normal in Mrs. C. (Fig. 3) at the time of hospital entrance. Two hours later and in spite of the rapid administration of 1,500 c.c. of blood transfusion, fibrinogen was absent, a circulating lysin was present, and the prothrombin activity was markedly decreased. The fibrinogen supplement (2.4 Gm.) given during the 30 minutes following delivery re-

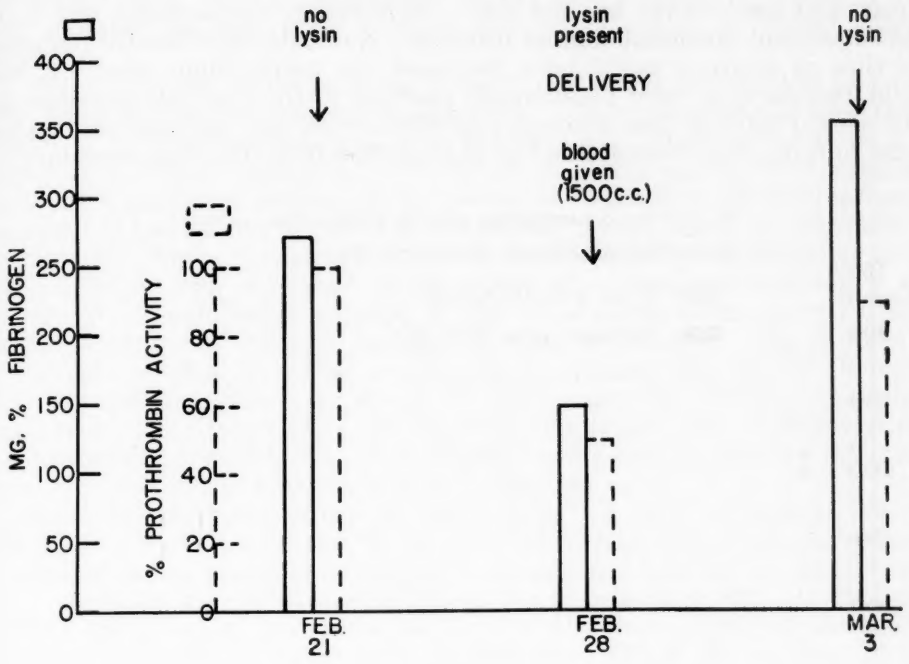

Fig. 1.—Blood changes in Mrs. McH.

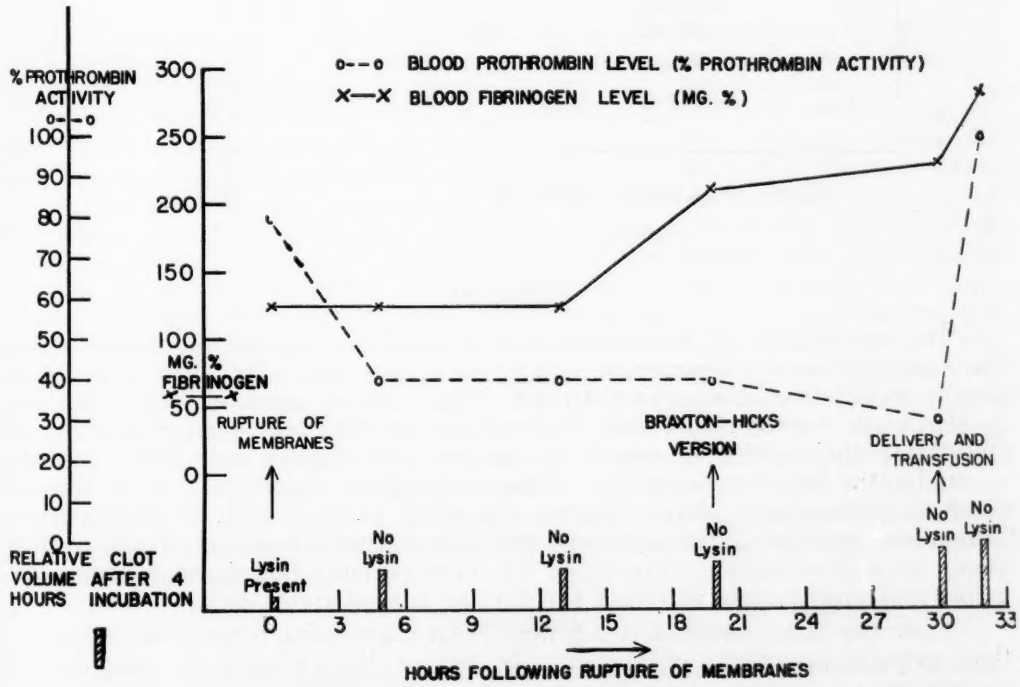

Fig. 2.—Blood changes in Mrs. G.

established stable clot formation in freshly drawn venous blood. The circulating fibrinogen had risen to 187 mg. per cent. Hemorrhage was arrested and there was no subsequent abnormal vaginal bleeding. No doubt additional transfusion at the time of delivery would have increased the prothrombin level. It was withheld because of a very questionable reaction to the previous transfusions. It is of special interest that a circulating fibrinolysin was demonstrated before artificial rupture of the membranes but was not identified after this procedure.

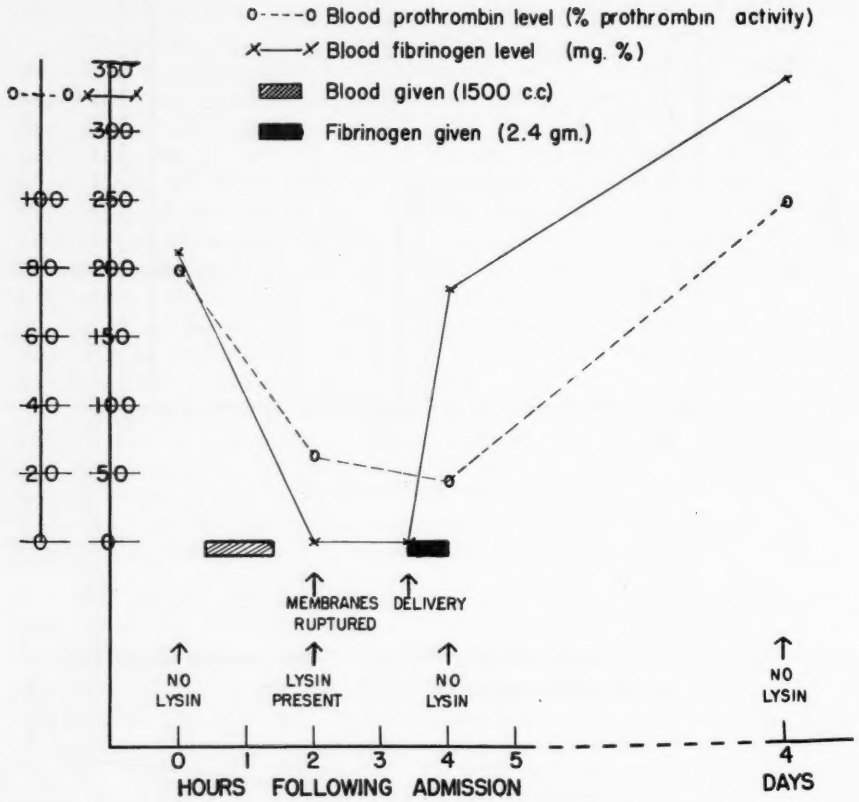

Fig. 3.—Blood changes in Mrs. C.

Comment

The components of the coagulation mechanism have been determined in three cases of severe premature separation of the placenta. The pattern of change was similar in each of the three. The changes consisted in a reduction in fibrinogen concentration and prothrombin activity and the presence of a circulating fibrinolysin. In one of the patients, the changes were severe enough to render the blood incoagulable. These changes do not appear to be due to shock and hemorrhage alone. During this study patients with blood loss from incomplete abortion, placenta previa, and postpartum hemorrhage from uterine atony were investigated. The blood of these patients had normal fibrinogen values and prothrombin activities and formed normal stable clots.

From the data presented, it is believed that coagulation defects follow rather than precede premature separation. In two of the patients the coagulation mechanism was normal prior to separation. The third patient entered with established changes in the fibrinogen and prothrombin values but these initial

observations were obtained after separation had occurred. Furthermore, during the scatter study of the coagulation mechanism in pregnancy, normal values were obtained in four other patients who subsequently developed placental separation.

The three cases which form the basis of this report had clinical and pathologic evidence of severe premature separation. Coagulation studies were entirely normal in 15 other patients who were bleeding with what proved to be a mild degree of placental separation. Therefore, it would appear that changes in the blood-coagulation mechanism in premature separation of the placenta are restricted to cases of the severe type. Because it is impossible to determine with certainty the degree of separation prior to delivery, it is suggested that coagulation studies be done whenever the diagnosis of premature separation is entertained. It is possible that a period of time must elapse after separation for the establishment of an upset in the blood-clotting mechanism. This is illustrated in the case of Mrs. C. whose coagulation mechanism was normal four hours after separation. However, six hours after placental separation, fibrinogen was absent, the prothrombin activity was diminished, and a fibrinolysin was demonstrable in venous blood. This emphasizes the need of repeated intrapartum blood examinations in patients with this condition.

From the observations of this study, there is a need for a rapid test which will detect a critical reduction in the blood fibrinogen concentration. From the experience of this study, observations of the size and stability of the clot formed by a sample of incubated venous blood is a satisfactory test. In the normal clotting test, the clot that forms is large, binds the majority of the red cells, resists shaking, and is stable after incubation at 37° C. for at least 24 hours. The venous blood of several hundred patients in pregnancy who formed such clots had adequate fibrinogen concentrations. When the plasma fibrinogen is less than 50 mg. per cent, initial clotting will occur but the clot cannot bind red cells and undergoes fragmentation within a few minutes. It appears that when a reduction of fibrinogen is observed in patients with premature separation of the placenta, it is accompanied by some decrease in the prothrombin activity. As a practical matter, if the patient's incubated venous blood clot is stable for one hour, enough fibrinogen is present for adequate hemostasis.

Correction of the defect in the coagulation mechanism is of primary importance in the treatment of severe premature separation of the placenta. When clot stability is inadequate, a transfusion of 1,500 c.c. of blood is indicated to replace blood loss and raise prothrombin activity. In addition, 2,000 to 6,000 mg. of fibrinogen should be given to re-establish the blood fibrinogen concentration to normal values. It appears that fibrinogen and prothrombin may be dissipated in these patients during labor. It is necessary, therefore, to repeat this therapy in the event that clot instability reappears. If adequate levels of fibrinogen and prothrombin are present at delivery, they are maintained thereafter. These studies indicate that a patient with severe premature separation of the placenta can be delivered vaginally with safety for the mother provided that the concentrations of fibrinogen and prothrombin are maintained throughout labor and delivery. Thus, the status of the coagulation mechanism at the time of delivery may be of more significance than the method of delivery. Whether the patient is delivered by the conservative or vaginal method, or by the radical or abdominal method may be of less importance than the correction of a possible defect in the coagulation mechanism.

Conclusions

1. A defect in the coagulation mechanism may develop in premature separation of the placenta.

2. The blood changes are characterized by a decrease in the fibrinogen concentration and prothrombin activity and the presence of a circulating fibrinolysin

3. These changes have been observed in cases of severe premature separation of the placenta. They are not evident in the mild type of premature separation.

4. The detection of these blood changes requires repeated observations of the size and stability of the clot formed by the patient's venous blood when incubated at 37° C.

5. Replacement therapy with fibrinogen and blood is of primary importance in the treatment of severe premature separation of the placenta.

Addendum

Since the above paper was written, a doctor from a neighboring town has been kind enough to furnish us with the history and a sample of antemortem blood from a patient who died from postpartum hemorrhage associated with premature separation of the placenta. Mrs. M. was a 41-year-old Rh-positive, gravida ii, para i, with a normal prenatal course. She entered in labor and the fetal heartbeat was absent. She was delivered by low forceps of a recently dead fetus 4 hours after admission and the placenta which followed immediately showed evidence of extensive intrapartum separation. During delivery the patient exhibited sudden shock, dyspnea, and cyanosis. Directly after delivery postpartum hemorrhage ensued. The uterus was packed but bleeding continued. Samples of venous blood which were taken for cross-match did not clot and there was no evidence of clot in the blood coming from the uterus. Studies at the Boston Lying-in Hospital of the antemortem blood taken from this patient at this time showed a total absence of fibrinogen. There was no evidence of an anticoagulant.

The patient was in profound shock 30 minutes after delivery and blood loss was so rapid that a hysterectomy was deemed advisable. This was done 3½ hours after delivery with the patient in critical condition. After operation the patient continued to bleed from the cervical stump, the abdominal wound, and the episiotomy. In spite of ten transfusions, death occurred 6 hours after delivery. In spite of adequate blood replacement, the coagulation mechanism remained deranged. This suggests that specific fibrinogen therapy was indicated.

The fibrinogen which was administered to the patients in this study was obtained through the cooperation of Dr. Louis K. Diamond. His interest in this project is appreciated.

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STUDIES ON VERATRUM VIRIDE*: STANDARDIZATION OF INTRAVENOUS TECHNIQUE AND ITS CLINICAL APPLICATION IN THE TREATMENT OF TOXEMIA OF PREGNANCY

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THE vasodepressor action of veratrum viride has been fully demonstrated in man and animals.[1, 6, 8] In man, the drug has always been given by the oral or subcutaneous route which made quantitative measurement of its hypotensive effect very difficult. The intravenous administration of the drug has not been attempted because of the complexity and the variability of the crude preparations of veratrum actually in use. Efforts have been made by investigators to isolate the pure alkaloids which would be more suitable for clinical and experimental work. Unfortunately, these pure substances are not yet available in sufficient quantity. Since most of the clinical investigations have been carried out with the crude preparations of veratrum, it appeared obvious that standardization of a technique and a dosage for the intravenous use of these preparations would be of great advantage. Better and more accurate evaluation of their action could be obtained, and at the same time new routes for their therapeutic application might be opened.

Thus, this work was undertaken, first, to establish a standard dosage and technique for the intravenous use of veratrum, and, second, to attempt application of this technique in the treatment of toxemia of pregnancy.

Material and Method

I. *Standardization of Intravenous Dose.*—Since veratrum viride has been used mostly in the treatment of toxemia of pregnancy,[1, 3, 4, 7] it was decided to assay the drug in patients with this disease in order to detect an optimum dose which would reduce the blood pressure to normal levels with a minimum of undesirable manifestations.

Ten patients with pre-eclampsia admitted to the obstetrics ward, not in labor, formed the material for this preliminary study. The diagnosis of pre-eclampsia was based on the appearance of hypertension, albuminuria, and edema during the last trimester of pregnancy. The age of the patients varied from 19 to 36 years. The weight, although recorded, was not taken into consideration in selecting the dosage to be employed. These patients were tested with different doses of the drug in the following manner:

All of the patients were placed at absolute bed rest for approximately twenty-four hours prior to the experiment. No treatment was given except a 0.9 Gm. sodium chloride diet. Blood pressure readings were recorded with the

*The veratrum viride preparation utilized in this study was Veratrone, Parke, Davis & Company, furnished through the courtesy of Dr. E. C. Vonder Heide.

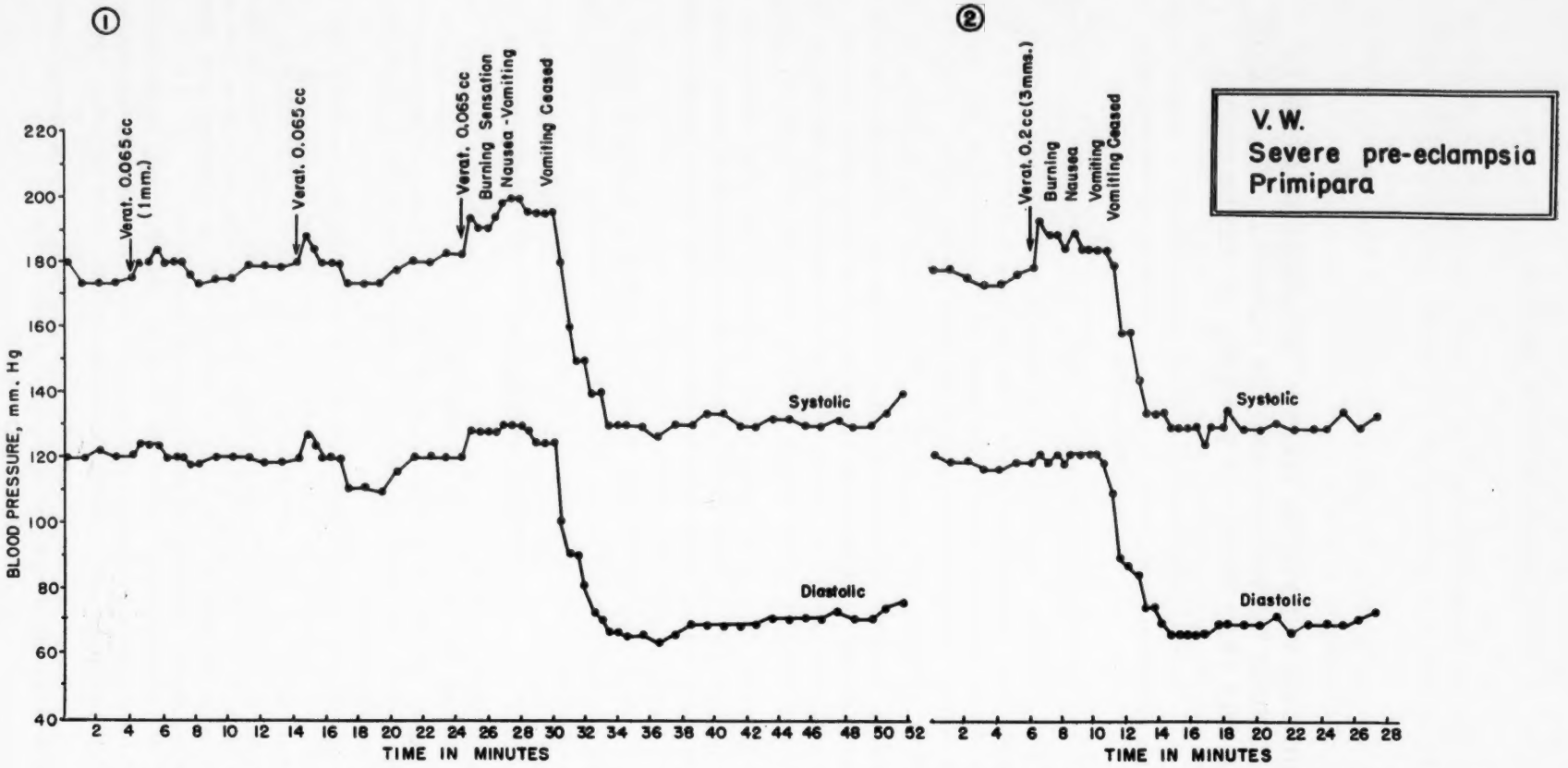

Fig. 1.—Effect of fractional doses and of single acute dose of 0.2 c.c. of veratrum viride on the blood pressure of severe pre-eclampsia.
(1) Fractional doses of 0.065 c.c. did not alter the blood pressure until a total of 0.2 c.c. dose was given.
(2) Effect of a single acute intravenous dose of 0.2 c.c. Note that in both instances, side effects lasted for approximately ten minutes and hypotension occurred thereafter.

patient in the supine position by the same observer to minimize personal variation. A control series consisting of 6 to 10 sphygmomanometric readings, taken at one-minute intervals was recorded. Thereafter, veratrum was given in an antecubital vein from a tuberculin syringe in consecutive doses of 0.065 c.c. (1 mm.) at ten-minute intervals. After the injection, blood pressure readings were taken at half-minute intervals and continued for ten minutes each time a dose was given. This procedure was continued until a fall of the blood pressure to normal levels was obtained. After the fall had been accomplished, the administration of the drug was discontinued, but readings continued in the same manner until the blood pressure returned to its original levels.

Six to eight hours were allowed for the effect of the doses of veratrum given to disappear completely. Then, the patient was given the total amount of veratrum which had produced the desired blood pressure fall in one single intravenous injection. Blood pressure and pulse rate recordings were done in the same manner as before.

Of the ten patients, five were submitted to double and three to triple the dose which had evoked the desired fall in the blood pressure. These so-called large doses were given in a single acute injection with an interval of twenty-four hours between each. Blood pressure and pulse rate recordings were similarly taken.

Results

A. *Effect of fractional doses:*

1. None of the toxemic patients studied had any hypotensive effect with a single dose of 0.065 c.c. (1 mm.). Slight burning sensation around the mouth and perspiration appeared in two patients with this initial dose. Nausea and vomiting did not occur. Pulse rate remained the same.

2. Two patients responded with a fall of 10 to 15 mm. Hg in the blood pressure to an additional dose of 0.065 c.c. (total 0.130 c.c.). With this dosage, the subjective symptoms of burning, perspiration, and nausea were more marked in all the patients despite the lack of hypotensive effect in most of them. Pulse rate was unchanged.

TABLE I. DATA ON BLOOD PRESSURE CHANGES OF THE PRE-ECLAMPTIC PATIENTS SUBMITTED TO DIFFERENT DOSES OF VERATRUM. THE FALL REPRESENTS THE LOWEST BLOOD PRESSURE READING WITHIN 10 MINUTES OF THE INJECTION OF THE DRUG

NAME	MEAN CONTROL* BLOOD PRESSURE (MM. HG)	BLOOD PRESSURE AFTER FRACTIONAL DOSES OF VERATRUM (MM. HG)	BLOOD PRESSURE AFTER SINGLE INJECTION OF 0.2 C.C. OF VERATRUM (MM. HG)	BLOOD PRESSURE AFTER 0.4 C.C. OF VERATRUM (MM. HG)	BLOOD PRESSURE AFTER 0.6 C.C. OF VERATRUM (MM. HG)
V. W.	178/118	128/62	125/66	118/58	78/40
G. T.	144/ 98	98/40	92/40		
T. B.	155/100	110/64	102/62		
M. H.	168/110	102/62	108/64	100/60	
L. F.	172/128	115/70	110/62	92/54	
M. B.	166/122	100/64	104/68		
W. C.	204/128	132/70	118/66	98/58	70/30
M. T.	182/120	102/80	110/74		
H. M.	180/122	110/72	110/70	100/66	60/28
H. F.	192/120	120/78	110/70		

*The mean control blood pressure was the arithmetic mean of 6 to 10 one-minute readings taken in the supine position.

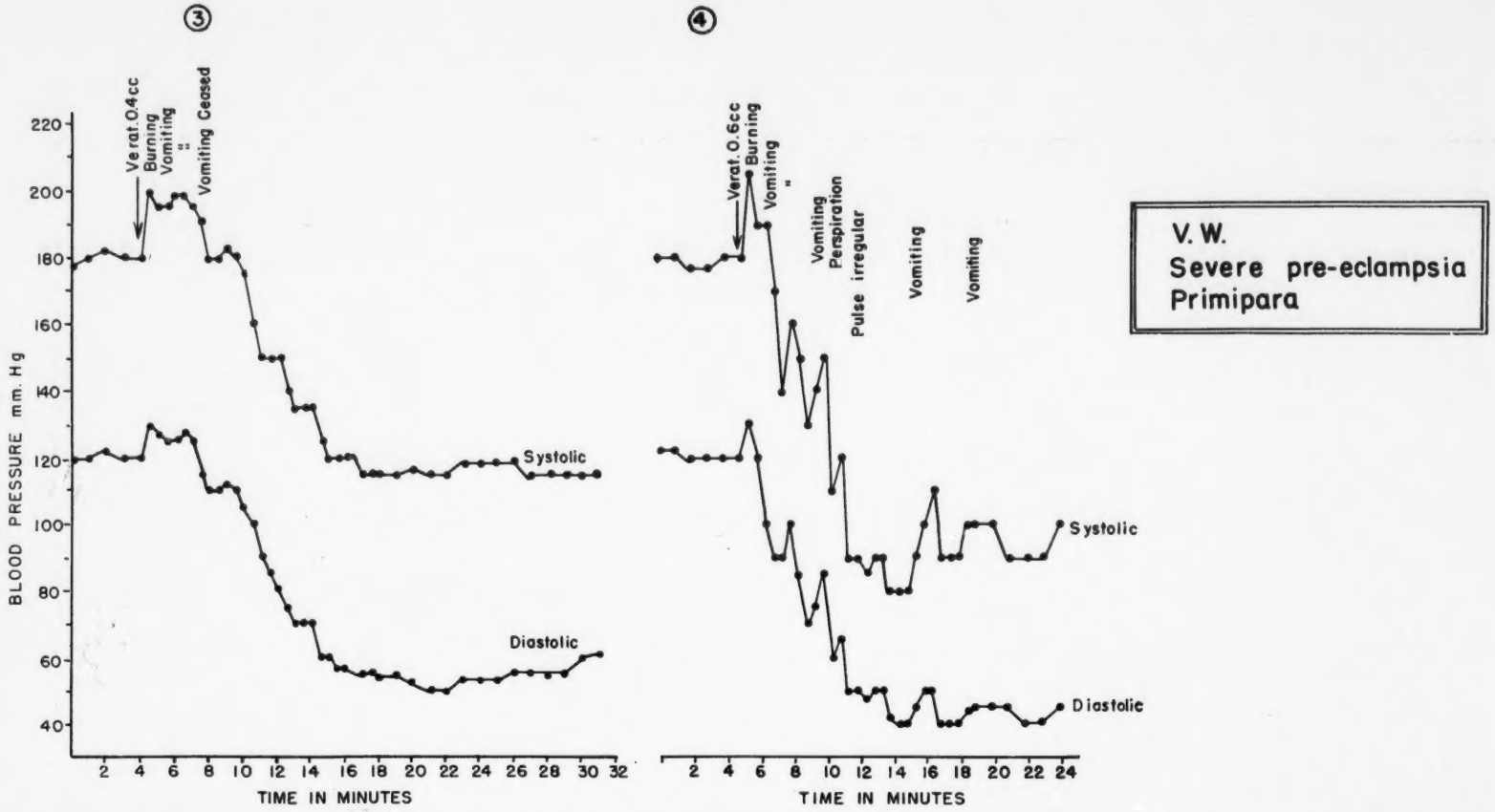

Fig. 2.—Effect of larger doses of veratrum viride on the blood pressure of severe pre-eclampsia. (The case was the same one illustrated in Fig. 1.)

(3) Effect of 0.4 c.c. dose. The blood pressure fall was slightly more marked than with the smaller doses.

(4) Effect of 0.6 c.c. dose. Note the marked hypotension and the irregularity in the blood pressure curve. Vomiting and other side effects were very marked.

3. All of the patients responded with a blood pressure fall to approximately normal levels when another dose of 0.065 c.c. (total 0.2 c.c.) was given. The blood pressure fall ranged from 45 to 80 mm. Hg in the systolic and 36 to 58 mm. Hg in the diastolic (Table I). In eight instances, there was a lapse of time varying from five to seven minutes between the third injection and the onset of the depressor action. During this time, burning sensation around the mouth and in the epigastrium, warmth, nausea, vomiting, perspiration, and apprehension were prominent. As soon as nausea and vomiting diminished, the depressor action started. In the two remaining cases, the subjective symptoms were minimal and the blood pressure fell one minute after the third injection.

The slope of the blood pressure curve was almost identical in all patients. In general, the fall in the diastolic blood pressure preceded that of the systolic by one or two minutes. The pulse pressure was maintained approximately within the control range.

The length of the hypotensive effect of the fractional doses varied from forty-five to seventy minutes (in two cases, the hypotension lasted ninety minutes) and ended with a gradual return of both systolic and diastolic blood pressure to original levels.

Pulse rate: A fall in the pulse rate ranging from 45 to 60 beats per minute was observed when the third 0.065 c.c. dose was given. There was no strict correlation, however, between the fall in the pulse rate and the blood pressure. The latter often fell before any change in the pulse rate was noted.

Subjective symptoms: These symptoms were most pronounced during the first seven to ten minutes after the administration of the third dose. The burning sensation, warmth, nausea, and vomiting were the first to appear and also the first to subside.

B. *Effect of the 0.2 c.c. dose given in one single injection:*

All of the patients tested with fractioned doses were subsequently submitted to one single acute injection of 0.2 c.c. of veratrum. The blood pressure response was, with minor variations, identical to that observed with the fractional doses (Table I). It is noteworthy that the five- to seven-minute lapse between the injection and the onset of the depressor effect was also observed here. Pulse rate variation and the subjective symptoms were the same as before. On the basis of these results, this dose was selected and was arbitrarily called the smallest effective dose.

C. *Effect of larger doses:*

1. Five patients were submitted to 0.4 c.c. dose of veratrum given in one single acute injection. In all instances, the blood pressure fell to levels ranging from 7 to 20 mm. Hg in the systolic and 4 to 8 mm. Hg in the diastolic lower than that produced by the smaller dose (Table I). The lapse of five to seven minutes between the injection and the blood pressure fall was observed in four patients. The slope of the blood pressure curves was almost similar to that of the other dose. The intensity of the subjective symptoms was somewhat greater.

2. Three patients were given a single injection of 0.6 c.c. of veratrum. Precipitous and irregular fall in the blood pressure to very low levels was observed in all of them (Table I). Headache, profuse perspiration, dizziness, severe nausea, and vomiting occurred and persisted for approximately one hour. Pulse rate became low and irregular with many extra systoles. The blood pressure curves showed many irregularities caused possibly by excessive apprehension and vomiting. Nevertheless, the hypotensive effect remained for

approximately two hours and, gradually, the blood pressure returned to control levels with improvement of the patient's condition. Fig. 2 illustrates the action of larger doses of the drug on a case of pre-eclampsia.

II. *Clinical Application.*—

Fifteen patients with convulsive eclampsia were submitted to a clinical trial of the intravenous technique of veratrum. Of the fifteen patients, thirteen had prepartum eclampsia and were in coma upon admission to the hospital. The remaining two had postpartum eclampsia.

Seven patients were given veratrum in acute intravenous doses of 0.2 c.c. repeated every hour, until the patient became rational and the danger of further convulsions was remote. Blood pressure and pulse rate were recorded every five minutes.

The treatment of the other eight cases consisted of an acute intravenous injection of 0.2 c.c. of veratrum on admission. Subsequently, the drug was administered by intravenous infusion in 5 per cent glucose and water, with the rate regulated so as to deliver an hourly amount of 0.2 c.c. of veratrum.

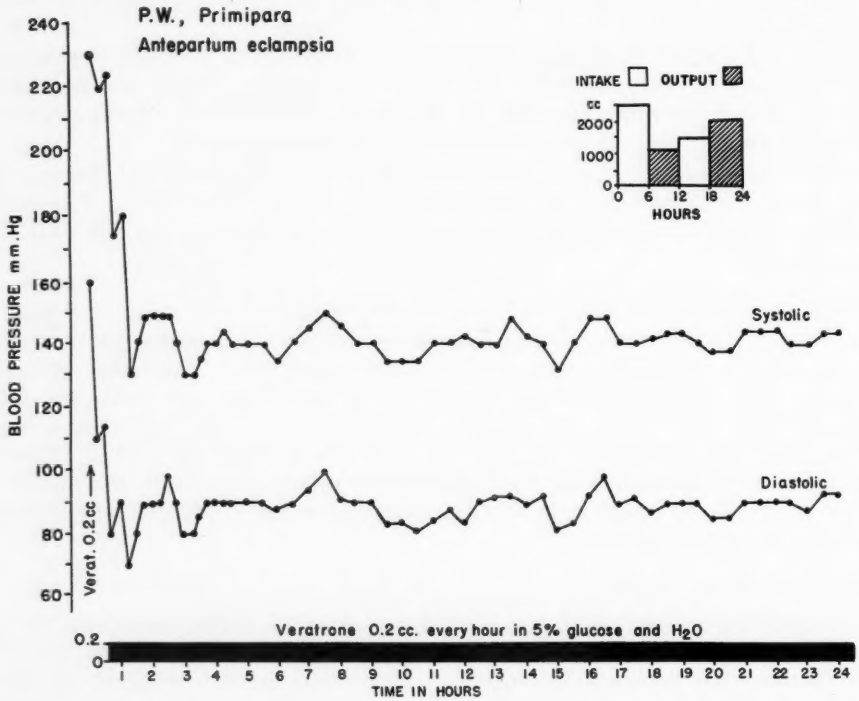

Fig. 3.—Illustrates a case of convulsive eclampsia treated with intravenous administration of veratrum. An initial acute dose of 0.2 c.c. was given on admission. Note the marked fall in the blood pressure. Subsequently, veratrum was given in intravenous infusion with 5 per cent glucose and water. The patient became rational three hours after the onset of treatment. Inset shows intake and output during the intravenous veratrum treatment.

In thirteen of the fifteen cases, the blood pressure and pulse rate fell to approximately normal levels within five to ten minutes of the administration of the first dose. In the two remaining cases an additional acute dose of 0.2 c.c. was necessary, fifteen minutes after the first injection, in order to bring about a satisfactory blood pressure decrease. In the cases where veratrum was given in single hourly injections, the blood pressure tended to return to its original level before the subsequent dose was administered. Consequently, the

blood pressure curve presented oscillations, and nausea and vomiting were prominent. When veratrum was given in intravenous infusion in 5 per cent glucose and water, the blood pressure and pulse rate were maintained at a low and more uniform level and, strangely enough, the subjective symptoms were less intense (Fig. 3).

The average duration of the intravenous veratrum treatment varied from twenty-four to thirty-six hours. During this time, the blood pressure and pulse rate were kept within normal ranges. In no instance did convulsions occur after the treatment had started. After the general condition of the patient had improved, veratrum was given subcutaneously, until the time of delivery. All of the fifteen patients were discharged well from the hospital.

Comment

It is agreed that the actual crude preparations of veratrum are of complex nature, unstable and variable in their composition and effect.[8] No standard effective dosage has been established. The exact number of alkaloids contained in such preparations is as yet undetermined. Nor is the action of each one of these alkaloids fully understood. Therefore, at the present, it is difficult to predict what elements are responsible for the vasodepressor action of the crude veratrum. Meilman and Krayer's[9] study on the action of veratridine and protoveratrine in man might advance our knowledge of these drugs. However, until these alkaloids are available in quantity sufficient for large-scale medical experiment we will have to be content with the empirical use of the crude preparations.

From the foregoing data it appears evident that the crude preparation of veratrum can be given safely by the intravenous route, regardless of its complexity. Several features of this route are worthy of discussion:

a. The depressor action of the drug does not appear until the amount of 0.2 c.c. is reached. Smaller doses are ineffective. This suggests the possibility of cumulative effect of the drug, the smallest effective dose being around 0.2 c.c. Larger doses invoke more marked depressor action but the side effects are intolerable.

b. After the administration of the smallest effective dose, there is a lapse of time (five to seven minutes) until the depressor action starts. This lapse of time was also observed when a double dose was given. It also coincided with the greater intensity of nausea and vomiting. Whether this delay in the action of veratrum is due to apprehension and increased intra-abdominal pressure from vomiting or due to some inherent property of the drug cannot be stated from this study.

c. The fall in the diastolic pressure begins before that of the systolic blood pressure. The pulse pressure remains within the control limits or wider. This suggests and further substantiates the idea[5, 6] that veratrum acts first by decreasing the peripheral resistance.

d. The hypotensive effect of the intravenous dose of the drug (0.2 c.c.) lasts for approximately one hour. It is difficult to evaluate this long effect since the site of action and the mode of excretion of the drug are not yet known. Nevertheless, it is obvious that this long action is of great advantage in clinical practice.

e. Tachyphylaxic reaction to veratrum was not observed, since the same patients were submitted to different doses of the drug without any decrease in its hypotensive effect.

Thus, the available evidence indicates that the 0.2 c.c. dose of veratrum is satisfactory and safe for the intravenous use of the drug, since it induced a desirable fall in the blood pressure of all the toxemic patients studied. Evidently, this dose is empirical and arbitrary and, because of the variability of

the crude preparations, it is prone to fail in decreasing the blood pressure in some patients. Recent studies[2, 3] with this dose have indicated that it invariably decreases the blood pressure in toxemia of pregnancy, yet it has no action on the blood pressure of normal pregnancy. This discrepancy in action of the drug and its multiple manifestations are discussed elsewhere.[2]

Clinically, the intravenous administration of veratrum in severe cases of eclampsia seems to be of great value. Despite the fact that the series treated is as yet small, there is indication that convulsive seizures are rapidly controlled and the patient becomes conscious and rational in a short period of time.

The intravenous infusion of veratrum in 5 per cent glucose and water presents some advantages. The blood pressure is maintained low on a more uniform level and the subective symptoms are less intense. Furthermore, this technique obviates the necessity for repeated injections with their troublesome effect on the patient. The objection might be made that the crude preparations are unsterile and unstable and therefore are not suitable for intravenous use. In the two series studied there was no harmful effect which could be attributed to these objections.

Summary and Conclusions

1. A standardization of technique for the intravenous use of veratrum viride was described.

2. The smallest effective dose assayed in a group of patients with toxemia of pregnancy was found to be 0.2 c.c. This dose produced a fall of the blood pressure to normal levels with minimal undesirable manifestations.

3. Clinical trial of this dose in a group of fifteen patients with eclampsia was given. Two methods were followed and the results were discussed.

4. Veratrum viride may be safely employed by the intravenous route either in single acute injections or in infusion with 5 per cent glucose in water.

Addendum

After this report had been submitted for publication, seven more cases of convulsive eclampsia were treated with intravenous infusion of veratrum in 5 per cent glucose and water, according to the method described in the text. In all the cases the blood pressure was maintained at normal levels and convulsions were controlled within a short period of time. Side effects were minimal. The patients were delivered and discharged well from the hospital.

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EFFECT OF TYPE OF DELIVERY ON FUTURE CHILDBEARING

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THE choice of method of delivery depends upon many factors, some of which are essentially constant, and others changing. The constant factors are such conditions as true disproportion, uterine inertia, and placenta previa, in the sense that these conditions are always present in a certain number of patients. The changing factors are: (1) the methods available to the operator; (2) the skill of the operator; and (3) the relative safety of these methods. The history of obstetrics details the appearance and development of new methods and the steadily increasing skill of obstetricians in their use. The "safety" of these methods has been variable, however, in that what was considered safe one hundred years ago is looked upon in a very different light today.

Perhaps the most outstanding example of change in safety is the operation of cesarean section. In the United States this operation was attended by a maternal mortality of 62 per cent in 1888,[1] of 2.5 per cent in 1923, and of 0 per cent since 1941 at the Sloane Hospital for Women.[2] This recent experience is not unique, but is matched at comparable institutions. Other obstetric procedures must therefore be considered in the light of these recent figures. It is generally agreed that the operation of high forceps should not be performed. Version and breech extraction are now performed very infrequently. The midforceps operation, however, continues to be performed, and it, therefore, seemed of value to compare the results of this operation with those of cesarean section.

The results of each operation consist in the immediate effect of the operation on mother and child, and the late effects upon the health of each. In addition, a new consideration has become of interest; that is, the statistical probability of further childbearing in women delivered by various methods. This factor of further childbearing has not been determined previously. It is an old maxim that if a woman delivers her first child with great difficulty, she will have an easier time with the next. This is quite true, in a general sense, but how often *does* she have another child?

Material and Method of Study

The data required for this study were gathered by examining the charts of 1,295 primiparous patients delivered at the Sloane Hospital for Women. These charts represent five groups of patients. Group 1 consists of 227 cases of midforceps delivery in the years 1942 to 1946. These represent a recent experience, during the interval in which the cesarean section mortality was zero, and afford an adequate comparison group. These patients were managed by

the same staff, and had available the same benefits of anesthesia, transfusion, and antibiotics, as the cesarean-section group.

The remaining groups were all delivered during the years 1932 to 1936. They represent a period of potential fertility of twelve to sixteen years, which is probably an adequate time in which to have a second child. Group 2 consists of 300 cases of midforceps; Group 3 consists of 300 cases of cesarean section; and Group 4 consists of 300 cases of spontaneous delivery. Group 5, from these same years, consists of 168 cases of postpartum hemorrhage.

In Group 1, the fetal mortality and the trauma to the mother were determined. In Groups 2 to 5, the incidence of further childbearing was determined, alone and in relation to length of labor, and, in addition, late complications of possible danger to the mother were also listed.

In obtaining this data, the follow-up is of paramount importance. As part of a large medical center, the Sloane Hospital for Women obtains an automatic follow-up on many patients who return to this institution for treatment of illnesses other than those of the reproductive tract, in addition to the follow-up of patients with repeated pregnancies. It is to be expected, then, that a considerable number of patients will be seen for many years. In these groups, some returned a year later, and some sixteen years later. The over-all percentage of those who returned was 75 per cent in the spontaneous and cesarean-section groups, and 60 per cent in the midforceps group. The shortest time in which a second child was born was one year, the longest, nine years. No attempt is made to define an adequate "follow-up" period, but this is probably less than the time of twelve to sixteen years used in this study. If a patient does *not* return, the cause for her failure to return may be sought among several factors. First, there are constant shifts of population, and variations in economic status, both of which cause patients to seek medical attention elsewhere. These factors, however, are essentially the same for all groups. Second, there is a psychological element best described as "patient satisfaction." A patient who has had an unhappy stay in this hospital, for any cause, will seldom return. Third, and most important in this study, failure to return means that the patient has not become pregnant again.

The ideal method of making this study would be to interview each patient, to discover whether she had become pregnant again, and what factors were operating in each case. This is a very large undertaking, and is never perfectly complete in such large groups, so that this method was felt to be impractical. In addition, the simple method of chart study reveals those patients who returned *by choice,* a consideration perhaps of some importance. The method of chart study was therefore adopted in preference to an attempted personal follow-up. In effect, then, these data represent the experience *of this hospital* in delivering these patients.

TABLE I. TRAUMA TO MOTHER AND CHILD IN MIDFORCEPS DELIVERIES

	NO. CASES	HEMORRHAGE		CERVICAL LACERATION		INCISION OF CERVIX		VAGINAL* LACERATION		FETAL† DEATHS		FISTULA	MATERNAL DEATHS
		NO.	%	NO.	%	NO.	%	NO.	%	NO.	%		
Disproportion group	157	18	11%	15	10%	0	0%	33	21%	6	3.8%	1	0
Inertia group	70	16	23%	13	19%	6	3%	20	29%	3	4.3%	1	1
Total	227	34	15%	28	12%	6	3%	53	23%	9	4%	2	1

*Greater than simple extension of episiotomy.

†This is the corrected figure. There was a total of sixteen stillbirths, of which three died before delivery, three died of cord complications, and one had multiple congenital anomalies. The nine recorded in the table died of clinical "birth injury." Autopsies were performed on seven of the nine, with laceration of the tentorium found in all seven.

It is seen in Table I that there is a fetal mortality of 4 per cent in midforceps, due directly to the operation itself. In addition, three other children died in utero during labor. If these (who would have lived had labor been shorter) are added to the nine lost directly, a total fetal loss of twelve, or 5.3 per cent, can be attributed directly to "delivery from below by forceps." In contrast to this figure, there was but one fetal death attributable to the operation in the series of 1,000 consecutive cesarean sections, and that was due to anesthesia.

Table I reveals that postpartum hemorrhage (blood loss of 500 c.c. or more) occurred in 15 per cent of midforceps deliveries. This incidence is exactly the same in the group of 300 cases delivered by midforceps in 1932-1936, and may well be a constant figure. In comparison, there is an incidence of 6.3 per cent associated with spontaneous delivery.

The mother, further, sustains considerable trauma to the cervix and vagina. Two vesicovaginal fistulas were produced. There was one maternal death, due to sepsis, after a labor of sixty-two hours in the presence of uterine inertia and fibroids, with cervical laceration and hemorrhage at delivery.

This group has also been subdivided according to the *chief* indication for the forceps. In many cases both disproportion and inertia were present, so that this does not represent a sharp division, but such a classification is useful in demonstrating that the "inertia" cases throughout are subject to greater trauma and risk than are the "disproportion" cases.

Late Effects of Delivery

Delivery produces late effects upon the ability (and willingness) of the mother to bear further children, and upon the future health of the mother. In Table II there is presented the frequency with which patients returned to the Sloane Hospital to bear further children. It is seen that only 35 per cent of patients delivered by midforceps return, while following cesarean section there are 52 per cent, and following spontaneous delivery there are 62 per cent, who deliver more children. The ultimate effect of delivery is seen in the *total* number of children delivered by each group of patients, for the group delivered spontaneously had 681 children, the cesarean group 517, and the midforceps group 443.

TABLE II. CHILDBEARING FOLLOWING DIFFERENT TYPES OF DELIVERY

TYPE OF FIRST DELIVERY	ONE CHILD ONLY	FURTHER CHILDREN					TOTAL CASES	TOTAL NUMBER OF CHILDREN
		NUMBER				%		
Midforceps	194	106				35%	300	443
		1 more	2 more	3 more	4 more			
		75	26	4	1			
Cesarean section	145	155				52%	300	517
		1 more	2 more	3 more	4 more			
		99	51	4	1			
Spontaneous	113	187				62%	300	681
		1 more	2 more	3 more	4 more			
		100	52	20	35			

The effects of delivery upon the future health of the mother (once she has recovered from the delivery itself) relate to the physical damage imposed upon the soft tissues. Delivery from below produces a certain amount of local injury, which in later years is seen as cystocele and rectocele. These local changes have been sufficient to require surgical repair in seven patients, or 2.3 per cent, delivered by midforceps; while of the patients delivered spontaneously five, or 1.7 per cent, required surgical repair.

TABLE III. INCIDENCE OF FURTHER CHILDBEARING ACCORDING TO TYPE OF DELIVERY AND LENGTH OF LABOR

TYPE OF FIRST DELIVERY	NUMBER OF PATIENTS WHO BORE FURTHER CHILDREN														
	NO LABOR			LABOR 1-22 HR.			LABOR 13-24 HR.			LABOR OVER 24 HR.			ALL CASES		
	TOTAL CASES	FURTHER CHILDREN	%	TOTAL CASES	FURTHER CHILDREN	%	TOTAL CASES	FURTHER CHILDREN	%	TOTAL CASES	FURTHER CHILDREN	%	TOTAL CASES	FURTHER CHILDREN	%
Midforceps	0	0	0%	81	32	40%	132	44	33%	87	30	34%	300	106	35%
Cesarean section*	168	97	58%	24	15	63%	32	13	41%	21	6	29%	245	131	51%
Spontaneous	0	0	0%	157	103	66%	104	62	60%	39	22	56%	300	187	62%

*In the original group of 300, there were 25 cases in which the length of labor could not be determined, and there were 30 patients sterilized at the first operation, so that a total of 245 cases were available for this analysis.

Cesarean section produces late changes in the uterus and abdominal cavity. It was found that rupture of the uterus in a subsequent pregnancy occurred in five cases, an incidence of 1.7 per cent. Three of these patients had had a classical operation, two had had a low-flap operation with vertical incision. None of these patients died, but one fetal death occurred with uterine rupture. In addition, there were seven cases (four classicals, three low flaps with vertical incision) in which the uterine scar at repeat cesarean section was found to be "very thin," requiring repair or hysterectomy. The total number of cases with rupture or weak scars is thus twelve, an incidence of 4 per cent.

It is evident that a difference exists in the frequency with which patients return to deliver further children. The cause for this difference was next sought for by examining the effect of length of labor, and of postpartum hemorrhage. In Table III are presented the results of an analysis of the effect of length of labor. There are no statistically significant differences produced within the primary group by variations in length of labor, although a "trend" seems to exist, and the length of labor cannot be correlated with a variation in future childbearing.

The effect of hemorrhage greater than 500 c.c. at the time of delivery was then studied in 168 patients delivered in 1932-1936 (Group 5). These cases represent all types of delivery. It was found that 59 of these patients, or 35 per cent, bore further children. In this group, however, there is a subgroup of 47 patients who went into shock, and of this group only twelve, or 25 per cent, returned to bear further children. This is a significant result, and indicates that severe blood loss and shock definitely reduce the probability of bearing further children.

Comment

The data presented above demonstrate that the midforceps operation is considerably more dangerous to the fetus than spontaneous delivery or cesarean section. The mother is more severely injured at the time of delivery when midforceps are applied, but the late effects of these injuries are negligible. Cesarean section, on the other hand, results in significant late effects upon the mother by producing the risk of uterine rupture in subsequent pregnancies. When spontaneous delivery cannot be performed, because of disproportion or inertia, or both, the *immediate* risk to the child from midforceps delivery (4 per cent) must therefore be compared with the *late* risk to the mother from cesarean section (4 per cent total of rupture plus weak scars).

The decision as to which risk to take will depend upon numerous factors obtaining in the individual case, but the present data furnish an important general factor: When the midforceps operation is performed, only 35 per cent of patients return to bear further children, while following cesarean section 52 per cent return. The midforceps operation therefore not only reduces the chances of obtaining a living child at the first delivery, but reduces the chances of the patient's delivering children subsequently.

To this factor must be added the effect of postpartum hemorrhage, which occurs in 15 per cent of midforceps deliveries. There are but 35 per cent of women suffering postpartum hemorrhage who return to bear further children. It may be assumed that smaller amounts of blood loss will have smaller, but similar, effects.

The effect of blood loss in cesarean section cannot be determined, because no estimate of the amount lost is usually made. However, it is generally assumed that the amount is considerable, and prophylactic transfusion is frequently given. This measure prevents the bad effects of hemorrhage and is highly desirable; but, unfortunately, it is very seldom used when midforceps are to be applied.

The data indicate, then, that the best method of delivery is the spontaneous method, and that cesarean section is next best, with midforceps last. Two conclusions may be drawn from this: First, all possible methods of examination should be used (and this most particularly means x-ray examination) in order to determine whether spontaneous delivery is possible, and then all efforts should be made to allow spontaneous delivery. Second, when spontaneous delivery is found not to be possible, the risk to the child must be carefully calculated, again by x-ray as well as by clinical examination; and, unless this risk can be surely determined to be small, the safer procedure for delivery will be cesarean section.

The midforceps operation should, therefore, be seldom performed. When it is, the risk to child and mother should be appreciated. X-ray pelvimetry should always be performed, so that the available space in the pelvis can be known. All measures to protect the mother, especially prophylactic transfusion, should always be carried out.

Summary

1. The fetal mortality ascribable to the method of delivery is 4 per cent in midforceps; 0.1 per cent in cesarean section, and essentially zero in spontaneous delivery.

2. The incidence of postpartum hemorrhage is 15 per cent in midforceps; 6.3 per cent in spontaneous delivery; and indeterminable in cesarean section.

3. The only maternal death ascribable to method of delivery was in the midforceps group.

4. The mother sustains serious lacerations of the genital tract in approximately 20 per cent of cases when delivered by midforceps, but the late effects of these are nearly negligible.

5. Spontaneous delivery is followed by further childbearing at the Sloane Hospital for Women in 62 per cent of cases, cesarean section in 52 per cent, and midforceps in 35 per cent.

6. Hemorrhage greater than 500 c.c. results in a probability of further childbearing of 35 per cent, and if shock is superimposed the probability drops to 25 per cent.

7. Spontaneous delivery not only is safest for mother and child, but also results in the greatest probability of future childbearing, and it should be sought for by all available means. Failing this, cesarean section is safer than midforceps and results in a greater probability of future childbearing.

8. The midforceps operation should seldom be performed.

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THE USE OF OVARIAN TRANSPLANTS FOR HORMONAL REPLACEMENT THERAPY

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TRANSPLANTATION of ovarian tissue for replacement therapy is by no means a recent procedure. In fact, this type of substitution of removed ovarian tissue was used before the turn of the century and as early as 1903 Martin[3] reported two cases of individuals in whom he had made heterotransplantations. From that time on until well after World War I the gynecological literature contains fairly frequent publications describing various different kinds of transplants to various different sites.

One of the most enthusiastic protagonists for this technique of hormonal substitution was Tuffier,[7] who used the adipose tissue of the abdominal wall as the most adaptable site for transplantation of ovarian tissue. On interviewing 37 of 65 patients on whom he had done grafts, having left the uterus in situ, he found that 32 had resumed normal menstruation. There is no evidence in this series to prove that some residual ovarian tissue might not have been left in the pelvis, however. In 1911 Hartmann[5] demonstrated quite satisfactorily that ovaries could be transplanted in cellular tissue if they were homeotransplants but that actually heterotransplants were incapable of differential growth and hormonal secretion in their new sites. Blair Bell[8] was probably the first to use the rectus muscle as a nidation site in any extensive series of transplantation operations. In those cases in which the uterus was left in situ he found that 66 per cent resumed normal menstruation. He made the observation that there is a usual lapse of three or four months postoperatively during which no menstruation occurs. This is because a certain amount of time is needed to enable the transplant to develop new vascular connection with the host and thus carry out its physiological hormonal activity. If, on the other hand, ovarian tissue is left by accident within the pelvic cavity, this time lag before the onset of menstruation does not occur. Therefore, he was of the opinion that this usual period of amenorrhea following this operation was an indication that no ovarian tissue had been adventitiously left within the pelvic cavity.

Numerous other sites than the rectus muscle or adipose tissue of the abdominal wall have actually been used for ovarian transplantation. The broad ligament, the omentum, the subperitoneal surface, and the areolar tissue of the labia majora have all been used as transplantation sites, all more or less successfully.

In recent years the operation of ovarian transplantation has largely fallen into disuse. Counseller[9] reported in 1940 that only fifteen patients in four years had been so treated at the Mayo Clinic, for instance, and Fluhmann[10] stated in 1936 that there had been no cases so treated at the University of

California since 1931. Reports in the literature concerning this operation have decreased considerably within the past twenty years. One of the most recent reports concerning this treatment was by Kuhn[11] in 1943 who found 100 per cent success so far as resumption of menstruation was concerned in eleven patients who had transplantation of ovarian tissue to the rectus muscle following ablation of the adnexa without removal of the uterus. Several of these patients continued menstruating as long as seven or eight years postoperatively.

Whether this type of operative therapy has fallen into disuse because of the ease with which pharmacological ovarian substitution products can now be administered, whether the operation has come to be generally considered as unsuccessful, or whether it has been generally discarded because of the possible complication of cyst formation at the site of the transplant is not known, but the authors feel that the operation of homeotransplant of ovarian tissue has a very definite place in gynecological surgical technique. Certainly it seems unfortunate to have to relegate to the condition of a premature menopause the young woman who must have all her ovarian tissue removed because of the presence of local ovarian or adnexal disease.

It is the subject of frequent discussion among gynecologists whether or not any ovarian tissue should be left in situ in the pelvic cavity following the removal of the remaining ovary, tubes, and uterus, because of fibroids, inflammatory disease, endometriosis, or for any other reason. Certainly the retention of ovarian tissue in situ within the pelvic cavity leaves the patient vulnerable to subsequent ovarian cyst formation or ovarian inflammation which might well necessitate a subsequent operation. On the other hand, unless ovarian transplantation is used, the only other choice is to remove all the ovarian tissue and subsequently maintain the patient on substitution therapy for an indefinite period to prevent the premature onset of a surgical menopause. A reimplantation of ovarian tissue, however, preferably into the rectus muscle, has such a high percentage of success so far as the resumption of estrogenic secretion by the ovarian transplants is concerned, and such a small percentage of uncomfortable or undesirable postoperative complications, that the technique seems to be a reasonable way out of the before-mentioned dilemma. If cyst formation occurs in the transplanted ovarian tissue, as it does occasionally, the transplant is so superficial that either it may be aspirated or the transplant removed if necessary under local anesthesia. Furthermore, if the uterus has been left within the patient and menstruation recurs in such a fashion as to make this phenomenon undesirable (i.e., menorrhagia or metrorrhagia) a small amount of radiation to the transplant by means of x-ray can easily control the difficulty.

A review of the literature indicates the undoubted presence of growth in numerous instances of ovarian transplantation in terms of actual physiological activity as represented by the resumption of menstruation in patients who have the uterus remaining in situ and also by occasional cases of evidence of corpora lutea in transplants which have been removed long after implantation operations.[7, 8, 10, 11, 12] It is interesting to consider the fact that apparent ovulation and corpus luteum formation can occur in ovarian tissue which is completely

surrounded by a muscular host. This would seem to cast a certain amount of doubt on the theory that ovulation in the intact ovary may sometimes be prevented by the thickness of the enveloping ovarian tunica.

The rectus-muscle site for the ovarian transplantation has come to be used in recent years as the practically exclusive locale for those comparatively few transplants which have been done. This is probably because of the vascularity of muscular tissue which enables the transplant quickly to acquire its own blood supply and also because of the proximity to the usual suprapubic midline incision which makes availability easy. Although transplants undoubtedly grow well within the omental tissue or broad ligament it would seem obviously impractical to use these areas as sites for transplants because subsequent cyst formation would leave the patient in as unfortunate a situation as if the tissue were left in situ. Transplantation into the adipose tissue of the abdominal wall or the areolar tissue of the labia majora is frequently satisfactory but does not supply the admirable vascularity of the rectus muscle.

Material

Within the past twenty years at the Sloane Hospital for Women 44 patients have been subjected to this type of operative therapy, 39 within the past ten years. The pathologic findings in these 44 patients were as follows:

1. Chronic pelvic inflammatory disease with or without fibromas of the uterus	24
2. Fibromyomas of the uterus and cystic disease of ovary	7
3. Benign ovarian cysts	5
4. Endometriosis with or without adenomyosis or fibromyomas of the uterus	6
5. Ectopic gestation and pelvic inflammatory disease	2

Thirty of these patients either could not be traced or had had their operations done at such a time that by now they are at a menopausal age anyway so that no attempt was made to follow them. An accurate follow-up was obtained in 19 of these patients, 5 of whom had had the uterus left in situ, usually because possible operative complications involved extreme difficulty in removal. Four patients developed spontaneous menstruation postoperatively which has continued for from four months to more than two years, respectively. One patient is still menstruating regularly. The onset of resumption of menstruation postoperatively varied in these patients for from three months to one year. Five patients have complained of a periodically tender mass at the site of implantation, but none has been considered by the patient severe enough to warrant either removal or radiation therapy. As further evidence of physiological activity of the transplanted ovarian tissue vaginal smears were obtained on 14 of the 19 patients followed. Ten of these had evidence of estrogenic activity. Urinary estrogen excretion studies were made on 12 of the 19 patients and 11 of these were found to have an excretion of 10 to over 40 gamma daily as determined by the Jailer fluorometric technique.[13] One patient who menstruated regularly and also observed a minor swelling in the area of the transplant during the midcycle time was instructed to keep a basal body temperature chart and was submitted to endometrial biopsy. The biopsy disclosed the presence of well-developed secretory endometrium on three separate

occasions indicating progesterone secretion by the implant and therefore corpus luteum formation. The temperature chart was equivocal because of the patient's inability to read a thermometer properly.

Comment

Relief of menopausal symptoms as an end point in determining the viability and physiological activity of ovarian transplants has not been discussed at all in this paper because it is considered by the authors as a too subjective and indefinite phenomenon to be a satisfactory end point in determining results of treatment. There is actually no way of telling in our satisfactorily treated patients whether or not any adventitious ovarian tissue was left in situ in the pelvis. The only thing that can be said concerning the possibility of this circumstance is that the authors know of no instance (with one exception) in which any of the surgeons carrying out these operations found a resumption of ovarian activity in patients on whom they had done ovarian ablations without transplantation. The one case noted proved to be one of pregnancy in a patient who was thought to have had a complete removal of both ovaries.[14] Furthermore, the conventional period of amenorrhea following operation, during which time the transplant is developing its vascularity and growth, has occurred in all those patients in whom the uterus was left in situ. Had intrapelvic ovarian tissue been left, the strong probabilities are that menstruation would have immediately resumed following operation. The only satisfactory way to prove this point would be to remove the successful transplant from the abdominal wall. Since this would defeat the entire purpose of the operation and be deleterious to the patient it has not been seriously considered.

The technique of transplantation has been so adequately reviewed in previous publications by other authors that it is not described in great detail here. So far as ultimate results are concerned, the technique of Kuhn[11] in inserting multiple small grafts (ten to fifteen) within different areas of the rectus muscle seems to have been the most satisfactory in terms of resumption of menstruation. It is usually the authors' practice to insert three or four strips of what appears to be normal ovarian tissue measuring about 2 cm. in length and 4 or 5 mm. in diameter in several areas within the rectus muscle. No suturing is necessary except for closure of the fascial sheath with repair of the abdominal incision.

Summary

1. The literature concerning the transplantation of ovarian tissue in the human being is reviewed and discussed.

2. Nineteen cases of homeotransplant of ovarian tissue to the rectus muscle carried out in the Sloane Hospital are reviewed.

3. The viability of the transplants is investigated not only in terms of resumption of physiological function by the organism (menstruation) but also in terms of vaginal smears, urinary estrogen excretion, endometrial biopsy, and basal body temperature chart.

Conclusion

The surgical technique of homeotransplantation of the ovary as a therapeutic measure to prevent surgical menopause in young patients is a procedure which has apparently fallen into disuse in recent years. The authors are of the opinion that this is an extremely satisfactory and harmless surgical technique which has an important place in the armamentarium of gynecologic surgery.

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LENGTH OF THE VAGINA FOLLOWING ABDOMINAL HYSTERECTOMY, TOTAL AND SUBTOTAL*

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VAGINAL length following total and subtotal abdominal hysterectomy has been a subject of discussion for many years. The purpose of this paper is to present a review of the literature and our results in actually measuring the vagina pre- and postoperatively.

In a survey of the literature one fact stands out. Most authors, in discussing abdominal hysterectomy, total or subtotal, make some statement regarding the length of the vagina but none quote figures showing actual length. The consensus was that most believed no shortening had occurred.

As early as 1917 Baldwin[1] reported on vaginal length following abdominal hysterectomy. Polak[2] in 1920 discussed the same problem. Masson[3] in 1927 reported he observed no actual shortening of the vagina. Von Graff[4] in 1931, Farrar[5] in 1934, Hagaman[6] in 1936, McDonald[7] in 1939, Masson[8] again in 1940, Miller and Prejean[9] in 1941, Danforth[10] in 1941 and again in 1945, Foss[11] in 1943, Morgan[12] and Phaneuf[13] in 1944, Mohler,[14] Mengert and Stoltz,[15] and Gaston[16] in 1945, Tyrone,[17] Hunt,[18] and Cianfriani[19] in 1946, and Cofer[20] in 1947 all discussed vaginal length in their reports. The above review quoted and others surveyed cover approximately 8,000 cases of abdominal hysterectomy. It is of extreme interest to note that though all of the authors made statements that they did not observe shortening of the vagina, there were actually only two statements as to the length. Mohler in 1945 in reporting 100 cases stated definitely that in his operation he did not shorten the vagina. In fact, he believed that there was some lengthening. Gaston, also in 1945, reported that he definitely had noted shortening in 7 per cent of his cases. The statements were made only on a clinical basis but no measurements were made.

To discuss vaginal length we must quote from the texts:

Schumann[21] 8.5 cm. in posterior fornix; 6.5 cm. in anterior fornix.
Curtis[23] 8 cm. in posterior fornix; 6 cm. in anterior fornix.
Bland[22] 9 cm. in posterior fornix; 7 cm. in anterior fornix.
Cunningham[24] 7.5 cm. in posterior fornix.
Adair[25] 7.25 cm. in posterior fornix.

Our method consists of measuring from the caruncles of the hymen to the posterior fornix with the speculum by employing a wooden applicator and measure. The following figures are presented as a survey of 167 cases with the average follow-up over one year in about 70 per cent of cases and 50 per cent over two years.

*Presented at a meeting of the Philadelphia Obstetrical Society. January 5, 1950.

TABLE I. 167 CASES

Preoperative length.—	
Average 8.4 cm.	
Extremes 7 cm. to 9.6 cm.	
120 cases of total hysterectomy.—	
Preoperative 8.4 cm. (Extremes 7 to 9.6 cm.)	
Postoperative 10.8 cm. (Extremes 8.1 to 13 cm.)	
Average increase 2.4 cm.	
47 cases of subtotal hysterectomy.—	
Preoperative 8.4 cm. (Extremes 7 to 9.6 cm.)	
Postoperative 10.0 cm. (Extremes 8.1 to 11 cm.)	
Average increase 1.6 cm.	

The technique of total and subtotal hysterectomy employed in the cases presented is as follows:

1. Dissection, sharp and blunt, of the bladder peritoneum as high on the body of the uterus as possible even to the level of the round ligaments. This gives a large flap of peritoneum to be used for peritonealization.

2. Cutting the infundibulopelvic and round ligaments as close to the uterus as possible with triple ligation of the infundibulopelvic and round ligaments together with one or two suture ligatures preventing slipping of sutures.

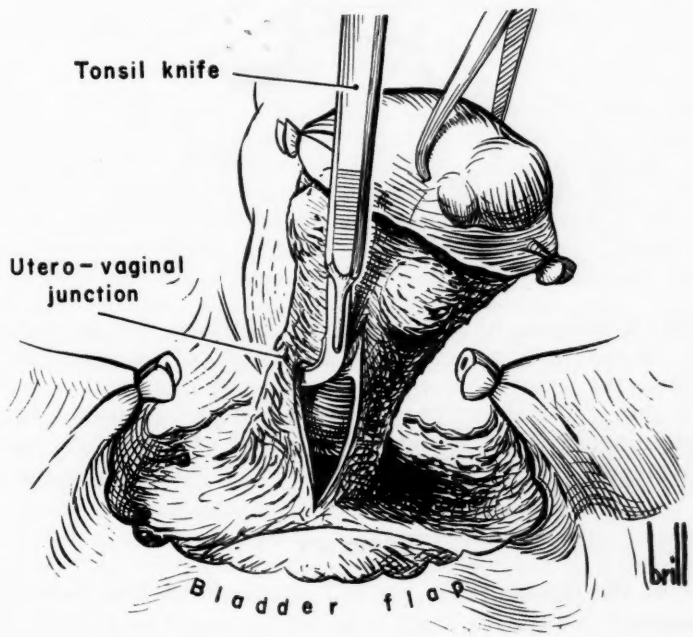

Fig. 1.

3. Stripping: of bladder and trigone from the uterus and cervix over anterior fornix. This pushes the ureters to the lateral pelvic walls.

4. High division and triple suture ligation of the uterine arteries above the internal os.

5. Enucleation of cervix from the vagina at the cervicovaginal junction by the use of a hooked tonsil knife, after incision into the vagina in vertical plane over cervix (Fig. 1).

6. Closure of the vagina in two layers. The first approximates the mucosa and the second approximates the vaginal fascia and perivaginal tissues.

7. Imbrication of the infundibulopelvic and round ligaments from each side individually to the vaginal cuff and to each other, thus supporting the vagina and helping in maintaining its length (Fig. 2).

8. The use of a purse-string suture running through the uterosacral ligaments and the free edge of the bladder peritoneal flap. This one suture peritonizes the entire raw area in the pelvis and also utilizes the shortening of the uterosacral ligaments further to support the vagina. In event the ovary or ovaries are retained, a great deal of care is exercised that these are outside the peritonizing suture. In some cases interrupted sutures are used for peritonizing.

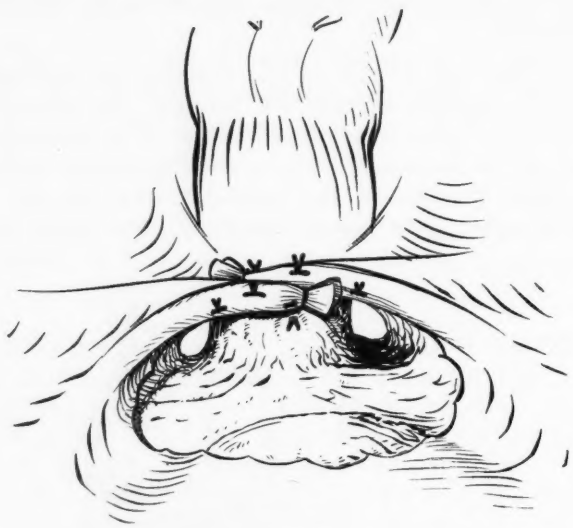

Fig. 2.

9. In event a subtotal hysterectomy is performed, the only change in technique is that the cervix is not enucleated but cut between the internal and external os. Then the infundibulopelvic and round ligaments are imbricated to the cervical stump. The occurrence of dyspareunia because of the imbrication of the infundibulopelvic and round ligaments or of the ovary resting on these imbricated ligaments, which several authors mentioned, has not occurred in this series.

Summary

A review of the literature on vaginal length following abdominal hysterectomy is presented. A report of 167 cases of increased vaginal length following a specific technique shows an increase of 2.4 cm. in total and 1.6 cm. in subtotal hysterectomy. This increased vaginal length is seemingly due to several factors: the inherent elasticity of the vagina, the imbrication of the supporting ligaments, in such a manner as to give a definite lift to the vagina, and a shortening of the utero-sacral ligaments.

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Discussion

DR. LEWIS C. SCHEFFEY.—Dr. Castallo has presented a unique study. Instead of merely restating the impressions that many of us have had for a long time, he has proceeded statistically and has measured the length of the vagina actually, and has found more or less lengthening on the average. Of course, this study does confirm the general impression, namely, that a total abdominal hysterectomy, even though the technique may vary, does not shorten the vagina, as is often stated in arguments against total hysterectomy, and hence does not cause dyspareunia. I would like to mention another complaint of those antagonistic to total hysterectomy and that is the so-called "dryness" of the vagina. In women having an active sexual life, removal of the cervix does deprive the vaginal epithelium of secretion from the cervical glands, but there is a source of secretion from Skene's tubules and from Bartholin's glands. This may be one of the factors that has influenced the group who are against total hysterectomy. From experience, and the personal point of view, we realize that most of the total hysterectomies are performed in women approaching the menopause or in the postmenopausal epoch. However, it has always seemed to me that individualization of the patient at hand is an excellent precept to follow, no matter what we are doing. In a woman under 35 or perhaps 40 years of age, if hysterectomy for a benign condition is needed and can be performed with simultaneous care of the cervix by cautery, if there is local disease present, and with coincidental conservation of an ovary or ovaries, a much happier sex life can be preserved and the symptoms of the so-called surgical menopause can also be lessened thereby. This is a personal viewpoint and is controversial, but I do believe conservative measures are better when young women require hysterectomy. Another point I should like to comment upon briefly is that actual lengthening as shown by these statistics is true, because of the fact that in the support of the vaginal cuff or vault there is a natural drawing upward of this part of the vagina. There is another factor that I should have mentioned earlier. Plastic operations accompanying hysterectomy of any sort may have been a cause for dyspareunia in some instances rather than the supposed shortening. That brings us to another consideration, namely, the results seen in vaginal hysterectomy. Very often a certain amount of shortening is inevitable in many instances. Dr. Castallo and Dr. Wainer

might make a similar study of shortening or lengthening of the vagina in patients in whom vaginal hysterectomy is contemplated. While some report no shortening of the vagina whatever in vaginal hysterectomy, I think that the majority of operators will admit that in vaginal hysterectomy, shortening rather than lengthening is likely to occur. This study provides actual figures instead of impressions as heretofore.

DR. CASTALLO (Closing).—I am in agreement with the impression of Dr. Scheffey. In vaginal hysterectomy there seems to be definite shortening of the vagina in some instances. In women younger than menopausal age in our group with total hysterectomy and the technique described, there have been no complaints of dyspareunia or vaginal dryness with ovarian retention. I see no contraindication to total hysterectomy in any age group, where the operation is feasible technically.

PREGNANCY HEMOGLOBIN LEVELS IN THE RURAL SOUTH

An Evaluation of the Use of the Copper Sulfate Screening Test in Clinics

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EXPERIENCE in the clinics conducted by the Mississippi State Board of Health with the copper sulfate falling-drop method of hemoglobin determination for the screening of pregnant women will be related. The hemoglobin values in almost 2,000 antepartum and postpartum tests will be reported and interpreted.

The test depends on the specific gravity of whole blood and the comparison of it with copper sulfate solutions, or solution, of known specific gravity. The test was developed by a U. S. Navy Research Unit in response to a need for a simple and accurate method of determining blood values.[1, 2] It was subsequently used extensively in the Army and Navy. The American Red Cross used it to separate the anemic from the nonanemic among potential blood donors. Hospital blood banks are using it today for the same purpose.

The hemoglobin values estimated by this test when compared by precise oxygen capacity determinations proved to be as accurate as the values obtained by the better types of colorimetric tests.[3] The method has been used satisfactorily in a variety of situations.[4, 5, 6]

A drop of whole blood is allowed to fall into a solution of copper sulfate of adjusted specific gravity and the behavior of the drop observed. Either venous or capillary blood may be used. The test has been described elsewhere in detail.[1, 2, 7]

Experience With the Test in Public Health Clinics

We provided prenatal care at the county units of the Mississippi State Board of Health and needed a test that would tell us fairly accurately which patients were anemic. We felt that screening the anemic from the normal patients was enough. It was not necessary to know the degree of anemia because we did not treat anemia. Women discovered to be anemic were sent to their local doctors for treatment. The test had to be simple enough for busy and technically untrained public health nurses to do. In the county health departments that were undertaking hemoglobin determinations as one of their services, the Tallqvist technique was used and we were long dissatisfied with its accuracy. Too often two different nurses would obtain two widely different readings. Defects inherent in the technique make it a slipshod choice among the modern procedures available. Dependence on the clinical diagnosis of anemia has no place today, and with the group of women we were caring for this was particularly true. In an anemic group, whom we had an opportunity to study more carefully in the hospital, the frequency of hemoglobin levels of 5, 6, and 7 Gm./100 ml., unattended by symptoms, was amazing. These studies will be reported elsewhere. The time-honored wise look at the everted eyelid proved deceiving. Conjunctival vessels were injected when they should not have been.

All of the nurses performing the test were taught or checked periodically by one other physician and the author. The nurses learned rapidly and it was unusual to pick up a flaw in technique once the test was demonstrated and then performed under supervision. More than five or ten minutes' instruction was not needed for any individual. The most frequent fault was a tendency to release the drops higher than the prescribed 1 cm.

When the test was installed as part of the services provided by the Board of Health, it was planned to test preschool and school children as well as maternity patients. A solution of specific gravity 1.049, equivalent to 11 Gm./100 ml. hemoglobin, was selected as being the best solution for the purpose. The need for simplicity prompted the choice of a single solution. Later a separate solution for pregnant women was used. The American Red Cross selected a copper sulfate solution of specific gravity 1.052, equivalent to 12.2 Gm./100 ml. of hemoglobin, to use in its screening. Only volunteers with levels above this were accepted as donors.

Glass capillary tubes of 1.0 mm. bore were provided for the collection of capillary blood. In practice, nearly all of the tests came to be done with venous blood because the nurses were adept at venipuncture, while the sticking of a finger was a new and less inviting act. The same blood was used for a serological test for syphilis.

The copper sulfate solutions were prepared by dilution of a stock solution in the headquarters at Jackson, Mississippi. The dilute solution was carried in a 4 oz. bottle, which will suffice for 100 tests. The preparation and dilution of the stock solution have been described elsewhere.[1, 2, 7]

Results of Survey and Discussion

The solution in use in 1947 and 1948, when the tests reported here were done, had a specific gravity of 1.049, equivalent to 11 Gm./100 ml. of hemoglobin. Patients below that level are classified as anemic. In 1949 the maternity patients began to be screened at 10 Gm./100 ml. (1.047) because of the growing feeling among investigators interested in anemia in pregnancy that that represented the minimum acceptable level; they are not included in these results. Furthermore, so many of the women were below 11 Gm./100 ml. that it was not practical to use that level.

The patients surveyed for anemia in this project are almost all from the lowest socioeconomic level in southern Mississippi. Over 95 per cent are Negro. The diet of these people is among the poorest in the United States.[8] They are all rural. A number of them live on the fringes of cities of over 20,000 population, but their diet, health, and mode of living are essentially the same as those of the others. Most of the women reported in this survey were having the first blood count of any type in their lives.

Analysis of Anemia Data

Hemoglobin determinations made on 1,669 pregnant women revealed that 876, or 52.5 per cent, were anemic. The tests were made in fourteen southern Mississippi counties (or ten health districts), at the time of the first prenatal examination at the health department and were scattered throughout the nine-month period.

The percentages of anemic patients (Table I) did not vary consistently from month to month and there was but little evidence that more of the women who were tested were anemic in the later months of pregnancy than in the earlier months. The highest rate (58.0 per cent) was found in the eighth month and the lowest (36.2 per cent) was in the ninth month. Some agreement will be found here with other reports that have found hemoglobin levels lowest

about the eighth month with some improvement in the ninth month due to decrease in plasma volume. From the lowest percentage of anemic patients to the highest, the months were 9, 2, 4, 3, 7, 5, 6, 1, 8. When the anemia rate was adjusted on the basis of a sample equally distributed throughout nine months, there was no significant change. Arranged by trimesters, the percentage of anemia showed a gradual increase as pregnancy progressed, but there was no significant difference between the lowest and highest percentages.

TABLE I. PERCENTAGE OF WOMEN FOUND TO BE ANEMIC, BY MONTHS

MONTH	TOTAL TESTS	NO. ANEMIC	PER CENT ANEMIC	STANDARD DEVIATION
1	23	13	56.5	10.34
2	103	38	36.9	4.75
3	160	82	51.2	3.95
4	230	108	47.0	3.29
5	257	138	53.7	3.11
6	255	141	55.3	3.11
7	250	131	52.4	3.16
8	174	101	58.0	3.74
9	47	17	36.2	7.01
Unknown	170	107		
Total	1,669	876	52.5	1.22

There appear to be real differences by health district (Table II). The range was from 32.6 per cent anemia in Lincoln County to 90.9 per cent in the Southeastern Health District. In several counties the samples were small, therefore large deviations could be expected in the percentages of persons found to be anemic.

TABLE II. PERCENTAGE OF WOMEN FOUND TO BE ANEMIC, BY HEALTH DISTRICT

HEALTH DISTRICT	TOTAL TESTS	NO. ANEMIC	PER CENT ANEMIC	STANDARD DEVIATION
Forrest	475	269	56.6	2.27
Harrison	224	98	43.8	3.31
Jackson	143	103	72.0	3.75
Jones	28	18	64.3	9.05
Lincoln	236	77	32.6	3.05
Marion	134	63	47.0	4.31
Pearl River	12	5	41.7	14.23
Pike	100	36	36.0	4.80
Southeastern	22	20	90.9	6.13
Tri-County	295	187	63.4	2.80
Total	1,669	876	52.5	1.22

The total percentage (52.5) appears to be a conservative estimate, since the sample was concentrated in counties having the lowest rates of anemia. If the rate is adjusted on the basis of equal distribution in the ten health districts, there is an increase which is not likely to be due to chance.

We do not know how much anemia is present in the general population. Since the variation tends to be geographic more than associated with the month of pregnancy, it seems entirely possible that considerable anemia would have been found whether the women were or were not pregnant. There is a rough correlation between the socioeconomic conditions of the patients in each district and the incidence of anemia.

An attempt was made to secure a hemoglobin test on these same women six weeks after delivery. Tests were made on 272 women and 124, or 45.6 per cent, were found to be anemic (Table III). There were wide variations by

district, with a range from 9.1 per cent in Marion County to 92.1 per cent in Jones County. The postpartum examinations constitute an inadequate sample that does not afford statistical interpretation. These postpartum examinations were not made on a selected group. Some counties have been more successful in incorporating a postpartum examination into their program than others. The number examined was small because the postpartum examination is a new idea in the region and not many have availed themselves of it. Indeed, the importance of *prenatal* examinations is being accepted slowly, and so much effort has to be devoted to impressing the public with its value that there must be less attention paid to the postpartum examination. To illustrate the extent of the problem, in forty-seven consecutive maternal deaths in southern Mississippi (1947-1948), nineteen had no prenatal visits to a doctor or health department.

TABLE III. PERCENTAGE OF WOMEN FOUND TO BE ANEMIC. POSTPARTUM EXAMINATIONS BY HEALTH DISTRICT

HEALTH DISTRICT	TOTAL TESTS	NO. ANEMIC	PER CENT ANEMIC	STANDARD DEVIATION
Harrison	26	9	34.6	9.33
Jackson	89	49	55.0	5.27
Jones	38	35	92.1	4.38
Marion	11	1	9.1	8.67
Tri-County	108	30	27.8	4.31
Total	272	124	45.6	3.02

Comment

Fifty-two and five tenths per cent of pregnant women with hemoglobin less than 11 Gm./100 ml. is a figure higher than that quoted in textbooks. Traylor and Torpin recently reported 30 per cent of 290 pregnant women in Georgia having levels less than 11 Gm./100 ml.[9]

The effect of hookworm infestation is negligible in the group recorded here because it is found so rarely in this section in the nonwhites.

This hemoglobin test has been done in county health departments all over the state as well as the counties reported here. Several thousand determinations have been done and many anemic women discovered. The test has consistently won local approval. The counties whose findings have been reported here were selected because they are the author's assigned district.

The possibilities of this test in rapidly screening patients in a large clinic seem obvious. Often, as many blood counts as one would want are not done because of limitation of laboratory facilities, time, and personnel. With this test the patients needing more thorough study can be rapidly and accurately found. It could be added to the multiphasic screening of other groups, for example, industry, schools, and private practice, at a small cost.

There is a need for study of anemia in pregnancy in the rural South. There is a lack of recognition in the medical profession of its prevalence and its handicaps to maternal health.

Summary

The copper sulfate falling-drop hemoglobin test is accurate, rapid, and can be performed by a technically untrained person. It has been adapted by the Mississippi State Board of Health to screen pregnant women.

In tests on 1,669 rural pregnant women, 876 (52.5 per cent) were found to have hemoglobin levels below 11 Gm./100 ml. There is no consistent variation

in the percentage of anemic women by month of pregnancy but there is a real difference by county. One hundred twenty-four (45.6 per cent) of 272 women were found to be anemic six weeks after delivery. This is an anemia survey of a group never before explored.

The test is widely acceptable to county health units throughout the state and the number of tests being done is increasing. Our experience recommends that 10 Gm./100 ml. of hemoglobin be used as the level to screen pregnant women.

The author gratefully acknowledges the assistance of Dr. Virginia Howard Downes, Director of the Division of Maternal and Child Health, Mississippi State Board of Health, who introduced this test into the State program.

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A CLINICAL EVALUATION OF THE FALK PROCEDURE*

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THE treatment of recurring gonorrheal salpingitis is highly controversial. Conservative medical management, consisting of diathermy and antibiotics, lends itself effectively to the treatment of early acute infections but surgery is necessary to effect a permanent cure in the chronically recurring cases. Since patients in the latter group are of such a low socioeconomic status, it is incumbent upon us to keep them symptom free and able to maintain uninterrupted employment.

An understanding of the mode of extension of gonococcal infection better enables one to comprehend the rationale of the Falk procedure.[1-5] It is generally accepted that the organisms spread by direct continuity along epithelium to endocervix, thence along the endometrium and out the cornua to invade the endosalpinx. That endocervicitis and endometritis occur concomitantly with salpingitis is undoubtedly true, but symptoms of these are masked by the acute nature of the tubal infection. Simpson[6] and Curtis[7] have shown that gonorrhea of the tube is self limited; the organisms die when the patient's temperature has been normal for a two-week period. This is apparently brought about by hermetic sealing of the focus of infection by inflammatory exudate which prevents the bacteria and their toxins from entering the systemic circulation. These factors led Falk to hypothesize that by interrupting the pathway of spread of the gonococcal organisms to the tubes, chronic recurrent salpingitis could be prevented.

The next problem was to determine the surgical procedure best suited to this type of infection, bearing in mind that such operation should be resorted to only for the relief of incapacitating symptomatology rather than for the removal of damaged organs. Bilateral salpingectomy, on first impression, seems a logical procedure; however, the technical difficulties involved in removal of pus tubes often culminate in undesirable radical surgery of the ovaries and uterus. Also, salpingectomy frequently interferes with the ovarian blood supply[8] sufficiently to cause ovarian cyst formation, thereby necessitating future oophorectomy. Unilateral salpingectomy and tubal plastic operations are often unsuccessful because of the high incidence of reinfection.[9, 10]

Indications.—Since these are relatively young women a certain percentage of whom can become pregnant following one or two attacks of salpingitis, we elect to perform cornual resections only upon those patients who have had at least three acute attacks. Each case is evaluated as to the duration of symptoms, the number of attacks, the type and adequacy of previous treatment, and the amount of incapacity caused by the disease.[15]

*Presented at a meeting of the Philadelphia Obstetrical Society, Dec. 1, 1949.

At the time of admission, each patient is given 100,000 units of penicillin intramuscularly every three hours along with 0.5 Gm. sulfamerazine and 0.5 Gm. sulfadiazine orally every six hours.[11, 12, 14] When acute symptoms have subsided, the temperature has been normal for at least seven days, the sedimentation rate is decreasing, and when the white blood count falls below 8,000, the patient is ready for operation. Also, there shall have been no marked or persistent rise in temperature following gentle bimanual examination. These criteria somewhat modify Simpson's[6, 13] and Falk's[1] prerequisites, but very definitely decrease the number of preoperative days of hospitalization. There was no incidence of postoperative morbidity in this series.

Contraindicative to cornual resection is the presence of ovarian lesions such as ovarian cysts or cystic ovaries, in which oophorectomy is strongly recommended. Such ovarian lesions accounted for the removal of one tube and ovary in twenty-two, or 35 per cent, of our patients.

Clinical Material.—Sixty-two patients with chronic recurrent gonorrheal salpingitis were included in this study. The average age was 25 years; one-fourth of the number were younger than 20 years. Ninety-five per cent were Negroes; 70 per cent had one or more children.

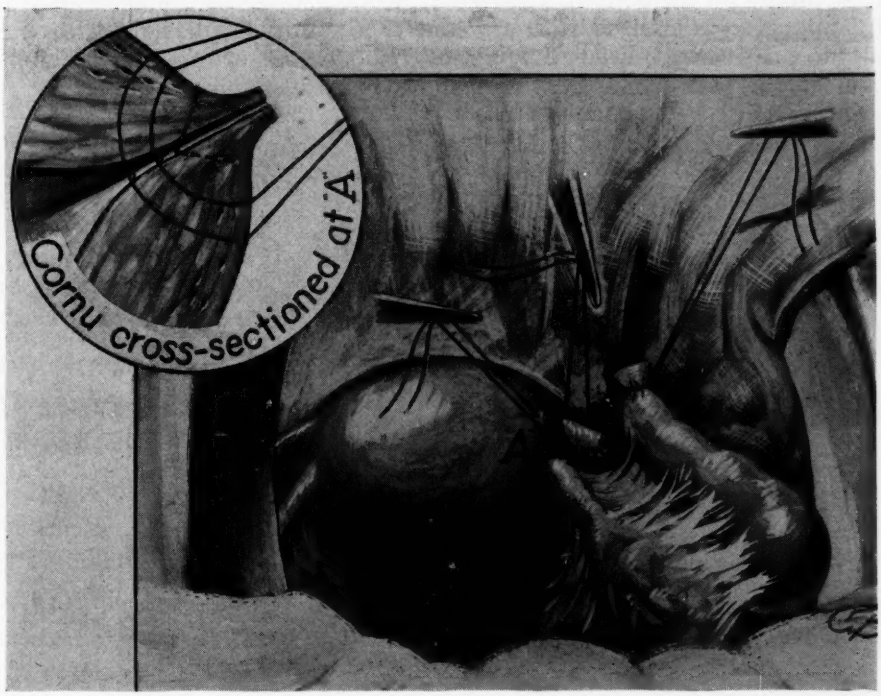

Fig. 1.—Right tube has been ligated and resected. Sutures have been placed through cornu. Dotted line indicates direction and depth of incision.

The duration of symptoms ranged up to eight years; the majority had suffered from eight to twelve months. In 45 per cent there had been incapacitating pain for a period of ten to fourteen days immediately prior to admission. Thirty-three per cent had more than three separate attacks of acute salpingitis and upon each occasion had received adequate outpatient or hospital treatment. Their inability to maintain steady employment was epitomized in almost every history. Although bilateral adnexal masses were palpable in over one-half the

cases, it was noted that the size of the pelvic masses was not an index of the number or severity of symptoms. Frequent pelvic examinations were avoided because of the danger of breaking down the inflammatory barrier.[6]

All patients received penicillin and sulfonamide therapy as described above from the time of admission until the temperature had remained normal for twenty-four hours postoperatively.

Operative Technique

The method of cornual resection as described by Falk is simple and concise;[1, 2, 3, 4] we have adopted the procedure in toto except for a few minor variations. A Pfannenstiel incision was used in 25 per cent of cases and was found most efficacious. When the abdomen is opened, the tubes and ovaries are examined with minimal disturbance of existing adhesions. As Falk[2] has emphasized, careful examination of the ovaries is imperative because tubal resection should *never* be done in the presence of cystic or abscessed ovaries.

The tube to be resected is ligated approximately one-half inch from the uterus and the suture ends are left long. The tube is severed and a generous stump is left. Parallel sutures are placed deeply through the cornual portion of the uterus with the ends held apart by an assistant as in Fig. 1. An Allis clamp is placed on the cornual stump and, while gentle traction is exerted on the clamp, the cornu is excised with a wedge-type elliptical incision, with care not to cut the previously placed cornual sutures. These sutures are tied following excision of the cornu, effecting immediate hemostasis (Fig. 2).

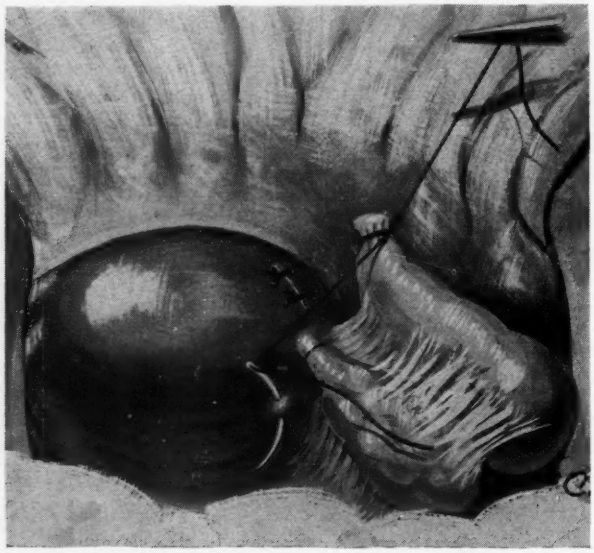

Fig. 2.—Cornual sutures have been tied. Needle in posterior wall of uterus denotes placement of free end of tube.

The long end of the suture used to ligate the tube is rethreaded on a round needle and a deep bite is taken in the posterior surface of the uterus, just below the attachment of the ovarian ligament. Tying this suture pulls the cut end of the tube against the uterine wall under the suspensory ligament of the ovary. The round ligament is utilized to cover the cornual portion in a modified Coffey suspension. The remaining tube is resected in similar manner.

Should the patient's condition warrant, appendectomy is done; in our series, incidental appendectomy was performed in 64.5 per cent of the patients. Pre-

vailing conditions being satisfactory, presacral neurectomy is recommended in those patients with primary dysmenorrhea of an incapacitating nature.

In a high percentage of cases the resected tubes were between 3 and 5 cm. in diameter. The average number of postoperative hospital days was 9.7. Only one patient developed morbidity using the criterion set down by the American Committee on Maternal Welfare; this patient was found postoperatively to have acute tonsillitis.

Results

Ninety-two per cent of the patients were observed over a period of thirty-five months, on an average of five postoperative visits per patient. None is included who had not been operated upon at least six months previously. Pelvic diathermy was administered triweekly for one month postoperatively to those patients having palpable adnexal masses at the time of discharge; approximately one-half, or thirty patients, received an average of ten diathermy treatments.

Dysmenorrhea was present through three postoperative menses in twenty-six patients; eighteen women who had previously noted moderate to severe dysmenorrhea were partially or totally relieved following operation. Profuse flow was noted by 25 per cent during the first two postoperative periods.

For the most part, adnexal tenderness had completely subsided within three weeks following operation; masses usually disappeared in four to six weeks.

Anatomically, 61 per cent had no residual adnexal masses, 33 per cent had mild adnexal thickening to very small palpable masses, and in 6 per cent definite masses remained. Clinically, only three patients complained of pelvic pain, and examination revealed no residual adnexal lesion to account for this symptom. Dyspareunia, if present prior to operation, was almost routinely relieved. Economically, all patients were capable of maintaining steady employment.

Three patients later developed severe gonorrhea of the lower genital tract, but none of these developed any evidence of salpingitis. No subsequent operative procedures were necessary in any of our cases.

Conclusions

1. The Falk procedure is a simple and safe operative treatment for recurrent gonorrheal salpingitis.

2. Sixty-two cases have been presented with clinical relief in 95 per cent.

3. The generous use of antibiotics decreases preoperative hospitalization and effects a higher percentage of good results.

4. Cornual resection prevents reinfection in cases of recurring gonorrheal salpingitis, relieves the patient of pelvic pain, and allows her to resume uninterrupted employment.

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Discussion

DR. LEON REIDENBERG.—I have not used postoperative diathermy. I have left the patients alone and they have gotten well. There is, however, a word of precaution. One patient did poorly but, in this case, I was forced to operate. She was bleeding more rapidly than blood could be restored because of coexistent fibroids. When the sedimentation rate began to drop and veins began to run out, I was forced to remove the uterus. The time of operation was poorly chosen and she came back with bilateral tubo-ovarian abscesses. I am certain that the evidence of ovarian involvement would have been obvious could we have delayed operation. Two patients had dysemenorrhea and I thought it was due to salpingitis. Following operation, these two women did not improve although the masses completely disappeared. The fourth case is most interesting. This patient developed bilateral hydrosalpinges postoperatively and was soon reoperated upon.

The burning-out of the infection is evidenced by hydrosalpinx. This is evidenced by the large, soft, insensitive tubes and these patients also get well. In my series in just under a year, there was no residual evidence of infection excepting in the patient cited above. The fluid is absorbed from the hydrosalpinx and the hydrosalpinx has neither clinical nor surgical importance.

DR. A. HERBERT MARBACH.—These results substantiate the claims of the originator of this form of treatment as is quite evident from the figures quoted in the paper. There are, however, some points that are absolutely essential, if this treatment is to be effective, and I would like to mention them again for reasons of emphasis because in evaluating any new procedure the interpretation of the indications must be clear-cut and definitive.

1. There must be no ovarian disease visible or palpable at the time that the cornual resection is done. Clinically, this can be evaluated in the following manner: Any patient who has gonorrheal salpingitis which is limited to the tube will have a normal temperature reading within a period of two weeks, whether treatment is instituted or not. If the temperature remains elevated longer than a period of two weeks, this is concluded to be presumptive evidence of ovarian involvement. This operation is not meant for those patients who have either cystic changes in the ovary or ovarian involvement. If it is used, reoperation will be necessary because ovarian disease must be removed and cannot be allowed to remain in place, since, from our experience, the ovary is not capable of taking care of such an infection.

2. The next most important contraindication to this procedure is that it should not be done on the first attack or on the second attack, but should be done after recurrent attacks. The operation is not done for the disease which is present but for the incapacitating symptomatology occasioned by the repeated attacks of salpingitis.

Concerning the rationale of the operation in interrupting the continuity between the cervix and the tube, it was found in a perusal of the literature that Robinson in 1903 described the use of hysterectomy in patients who had pus tubes, leaving the pus tubes in situ, with recovery of these patients and absence of symptoms following the operation. Falk originally theorized then that if removal of the uterus caused a regression in the pus tubes and prevented recurrent attacks, the continuity was the important factor involved, and if the tubes were severed from the uterus, they could not be reinfected. Consequently, he set out approximately in 1932 to do cornual resection as a treatment for recurrent salpingitis. Since then, 1,000 cases have been done under his aegis and the results are just as good as Drs. Freed and Kimbrough report this evening.

DR. MARIO A. CASTALLO.—I do not entirely agree with the procedure. It is a little incongruous to me to do a cornual resection only and leave a pelvis which is full of diseased organs and a uterus whose only function is to allow the patient to have a monthly period. It is my feeling that if one is going to do a cornual resection this per se immediately forestalls any possibility of a patient becoming pregnant later on and therefore to leave a uterus and pelvis which are diseased does not seem to be good surgical judgment.

DR. KIMBROUGH (CLOSING).—Dr. Marbach is particularly well qualified to discuss this subject as he had his training with Dr. Falk during the period in which he was developing the procedure.

We agree with Dr. Reidenburg that diathermy is of relatively little value except in those cases in which masses persist after the Falk procedure has been carried out. It is interesting to note that in only four of our sixty-two patients were there palpable masses after an interval of six months.

Dr. Castallo's reluctance to accept this procedure can easily be understood by the speaker. I was not at all impressed with the rationale of the operation but sanctioned this piece of investigative work as it had already been started when I took over the Service at the Graduate Hospital three and one-half years ago. Observation of the results which have been obtained has convinced me that the procedure has a very definite place in the treatment of recurrent pelvic inflammatory disease in young women. Removal of an acutely inflamed pus tube with attempt to conserve its corresponding ovary often results in cystic degeneration of the retained ovary. Such ovarian changes are so frequent that we have abandoned this procedure except under very unusual circumstances. Therefore the only alternative to the Falk procedure would be removal of one or both ovaries. Needless to say, I much prefer the Falk procedure to castration of young individuals. I firmly believe that preservation of menstrual function is of sufficient psychological importance to make it highly desirable in patients under 30 years of age. I would like to call your attention again to the fact that the average age of our patients was 25 years.

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THE USE OF STREPTOMYCIN DURING PREGNANCY

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DUE TO the widespread use of streptomycin in the treatment of pulmonary and extrapulmonary tuberculosis during recent years, obstetricians have questioned what the effect of this drug might be on the developing fetus when prolonged administration occurs during pregnancy. Because of the susceptibility of the newborn and young child to the effects of streptomycin, particularly eighth-nerve damage, the question is raised as to whether babies born of mothers so treated might possibly be born deaf or with permanent vestibular malfunction. This seemed especially pertinent when treatment was given during the first trimester.

Review of the recent literature revealed only three articles dealing with this subject. Watson and Stow[1] reported two patients, one with pulmonary and the other with renal tuberculosis, both in the second trimester of pregnancy, who received 2 Gm. of streptomycin daily (400 mg. five times daily) for 95 and 90 days, respectively. Blood serum levels of streptomycin ranged from 12 to 24 mg. per cubic centimeter. Pregnancy was allowed to continue in both cases and clinical improvement was noted following the administration of streptomycin. Both infants were normal at birth, without apparent eighth-nerve dysfunction. Nutrition and development were normal and follow-up examination ten months later revealed no abnormalities.

Woltz and Wiley[2] and Heilman and associates[3] have demonstrated streptomycin in the fetal blood and amniotic fluid following parenteral administration to the mother. The streptomycin concentration in the cord blood and amniotic fluid were generally lower than in the maternal blood, usually approximately one-half, or less.

During the last eighteen months five patients with pulmonary and extrapulmonary tuberculosis, treated with streptomycin some time during their pregnancy, were delivered on the obstetrical service of the Cincinnati General Hospital.

The object of this paper is to review these cases and discuss the results obtained.

Case Reports

CASE 1.—E. C., No. 238281, Negro, registered patient, aged 20 years, gravida ii, para i, estimated date of confinement Aug. 14, 1948, was first seen in the prenatal clinic on May 3, 1948, in the twenty-sixth week of gestation, and was admitted to the hospital.

Her chief complaints were severe exertional dyspnea, insomnia, paroxysmal nocturnal dyspnea and anorexia of one week's duration. During the two days prior to her clinic visit she had had shaking chills and fever with increasing substernal oppression. This substernal pain had begun three weeks previously as a "soreness" between the scapulae. Later this soreness was noted in the left shoulder and left side of the neck.

Past History.—Noncontributory. Denied contact with tuberculosis.

Physical Examination.—Pulse was 106, temperature 100.4° F., respirations 28, blood pressure 100/60. The patient was a well-developed, well-nourished Negro woman, slightly dyspneic in mid-Fowler's position. A maculopapular rash was noted over the extensor surfaces of the arms and legs (barbiturate sensitivity reaction). The thyroid gland was symmetrically enlarged. The chest was clear. There was definite enlargement of the left border of the heart. Numerous ventricular extrasystoles were noted. No murmurs were heard. The uterus was approximately seven months' size and the fetal heartbeat was present. The day following admission a definite pericardial friction rub became audible.

Laboratory.—Red blood cells, 5.1 million; hemoglobin, 14.5 grams; white blood cells, 5,200, with a normal differential; sedimentation rate, 20 mm. (corrected); urine, negative; circulation time (Decholin), 20 seconds; venous pressure, 12.4 cm. water. Blood culture was negative. P.P.D. tuberculin test No. 1 was negative. P.P.D. tuberculin test No. 2 was positive. The electrocardiogram revealed premature ventricular contractions and sinus tachycardia. A later reading was "suggestive of pericarditis." Routine agglutinations for typhoid, paratyphoid, and brucella were negative. A throat culture revealed beta hemolytic streptococci. The Kahn test was positive. An x-ray of the chest revealed pericardial effusion.

Course.—A presumptive diagnosis of pericarditis of infectious or rheumatic etiology, secondary syphilis, and seven months' intrauterine pregnancy was made. Penicillin and salicylate therapy were initiated. The course continued to be stormy with daily temperature elevations to 101° F. Two weeks after admission, antisyphilitic therapy with Mapharsen and bismuth was begun, but an arsenical toxic hepatitis soon developed. This was treated with BAL. She continued to run a downhill course with severe jaundice, increasing dyspnea, enlarging heart, and increasing venous pressure. Liver function tests revealed a severe degree of hepatitis. The prothrombin concentration dropped to 26 per cent. Additional treatment consisted of hepatic diet, vitamin K, multivitamins, and methionine. After two weeks she had improved symptomatically but continued to be febrile. Five weeks after admission a pericardial tap was done and 100 c.c. of cloudy, yellow fluid were removed. Tubercle bacilli were found in a concentrated specimen of the fluid. A diagnosis of tuberculous pericarditis was therefore definitely established.

Treatment.—Streptomycin, 500 mg. every 12 hours, was started on June 14, 1948, when the patient was in the thirty-first week of pregnancy. Treatment was continued up until the time of delivery six weeks later. She improved markedly on this therapy. The total amount of streptomycin administered before delivery was 42 Gm.

Labor began at 2 P.M. on July 23, 1948. She was delivered 7 hours, 53 minutes later, spontaneously, under pudendal block anesthesia. The infant, a normal boy, weighing 7 pounds, 8 ounces, breathed and cried spontaneously. Response to sounds of varying intensity were immediate. The puerperium was uncomplicated. Streptomycin was continued in 500 mg. dosage twice daily for six weeks following delivery. Serial audiograms, caloric tests, blood urea nitrogen determinations, blood counts, and urinalyses revealed no signs of streptomycin toxicity. The patient was discharged on Sept. 22, 1948, and was followed in the outpatient clinic for one year. Follow-up electrocardiograms were interpreted as being consistent with chronic pericarditis.

The infant was examined in the ear, nose, and throat clinic at the age of 1 year. The hearing appeared normal by gross tests. Cold water caloric tests revealed nystagmus of normal strength and duration. No evidence of eighth-nerve involvement was found.

Eleven months following delivery the patient returned to the prenatal clinic approximately twenty-four weeks pregnant. This pregnancy continued uneventfully without specific treatment, and she was delivered of a normal infant in October, 1949.

CASE 2.—C. P., No. 177299, white, registered patient, aged 35 years, gravida ix, para viii, estimated date of confinement Nov. 12, 1948, was first seen on the urologic service on May 27, 1948, when it was discovered that she had renal tuberculosis complicating a twelve weeks' intrauterine pregnancy. Dysuria, frequency, and macroscopic hematuria had been present for three weeks.

Past History.—Gross hematuria had occurred intermittently for six years prior to admission. In 1946, following retrograde pyelography, a positive smear for tubercle bacilli was obtained from the left kidney.

Physical Examination.—Pulse was 80, temperature 98.6° F., respirations 22, blood pressure 120/80. The patient was a well-developed, poorly nourished white woman who appeared to be chronically ill. There was marked left costovertebral angle tenderness with radiation to the suprapubic region. The uterus was enlarged and compatible with a pregnancy of twelve weeks' duration.

Laboratory.—Red blood cells, 2.8 million; hemoglobin, 7.8 grams; white blood cells, 7,800; urine, pH 6.5; specific gravity, 1.016; albumin, 1+; sugar and acetone, negative; microscopic, loaded with red cells, chain cocci and diplococci; blood urea nitrogen, 9.8 mg. per cent; Kahn test, negative; x-ray of chest, questionably enlarged node, left hilum, with essentially normal parenchyma. Cystoscopy and ureteral catheterization were performed and gross blood was seen spurting from the left ureter. Culture of urine from the left ureter revealed *Aerobacter aerogenes.* Culture from the right ureter revealed *Bacillus pyocyaneus.* Concentrated smear of the urine from the left kidney revealed acid-fast bacilli. Guinea pig inoculation was likewise positive for acid-fast organisms.

Treatment.—This consisted of sulfadiazine-sulfathiazole mixture, blood transfusions, ferrous sulfate, and multivitamins. Streptomycin, in a dosage of 250 mg. twice daily, was begun on April 19, 1948, when the patient was eight weeks pregnant and was continued for a period of six weeks. No apparent toxicity to the drug was noted. Repeated smears and cultures for acid-fast organisms were negative on May 18, 1948, and on five subsequent examinations. The pregnancy was, therefore, allowed to continue. She was discharged on June 30, 1948, and was followed in prenatal and urology clinics. During the remainder of her pregnancy she remained asymptomatic and hematuria did not recur.

Spontaneous delivery occurred on Nov. 19, 1948, under pudendal block anesthesia. The infant, a normal boy weighing 7 pounds, 5 ounces, breathed and cried spontaneously. Response to sounds of varying intensity was immediate. Postpartum sterilization was performed and the puerperium was uneventful. The patient was discharged on the fourteenth postpartum day.

The infant, following a normal hospital course, was tested in the ear, nose, and throat clinic at the age of 8 months. Gross auditory acuity and vestibular tests were normal.

CASE 3.—M. V., No. 217302, Negro, registered patient, aged 25 years, gravida iii, para ii, estimated date of confinement April 17, 1949, was admitted on April 26, 1949, having delivered a full-term infant in the ambulance. Physical examination was negative except for evidence of pleural thickening and a small amount of fluid at the left lung base. The patient had been in a sanatorium since Sept. 8, 1948, with a diagnosis of pulmonary tuberculosis, moderately advanced. Examination of pleural fluid had revealed tubercle bacilli. The red cell count was 4.1 million and the hemoglobin 11.2 grams. Urinalysis was negative. X-ray examination of the chest revealed pleural thickening over the entire left side with a small amount of fluid at the left base. A cavity was present in the left apex with scattered exudate in the left upper lobe.

Streptomycin, in a dosage of 500 mg. twice daily, had been started during the fourteenth week of pregnancy and was continued through the twentieth week. The patient made steady clinical and x-ray improvement up until the time of delivery. Three months post partum improvement was still evident.

The infant was a normal girl weighing 7 pounds, 6 ounces. All reflexes were physiological and response to external stimuli and noises appeared normal. Follow-up examination obtained at the age of 6 months revealed normal auditory and vestibular function.

CASE 4.—A. L., No. 255199, white, registered patient, aged 34 years, gravida vii, para iv, estimated date of confinement Aug. 26, 1949, had had uncomplicated previous pregnancies. Far-advanced pulmonary tuberculosis was discovered in November, 1948,

on a routine chest film in the prenatal clinic. She was hospitalized March 3, 1949. Sputum was positive for tubercle bacilli. Streptomycin, 500 mg. daily, was started March 15, 1949, in the sixteenth week of pregnancy and was continued until the twenty-second week. Clinical and radiologic improvement resulted.

Delivery occurred spontaneously on Sept. 5, 1949. Pudendal block anesthesia was utilized. The infant, a normal boy weighing 7 pounds, 15 ounces, breathed and cried spontaneously. Examination of auditory and vestibular function at birth and two months later appeared normal.

CASE 5.—M. C., No. 254602, white, registered patient, aged 24 years, gravida ii, para i, estimated date of confinement July 25, 1949, had pulmonary tuberculosis, moderately advanced, which had been diagnosed in February, 1949. She was admitted to a tuberculosis sanatorium March 3, 1949. Sputum was negative. Streptomycin, 500 mg. daily, was started March 16, 1949, in the twenty-third week of pregnancy and was continued until the twenty-ninth week. Clinical and radiologic improvement resulted.

Spontaneous delivery occurred on Aug. 4, 1949. Pudendal block anesthesia was utilized. The infant, a normal girl weighing 10 pounds breathed and cried spontaneously. Examination of auditory and vestibular function at birth and three months later appeared normal.

Comment

For many years the management of pregnancy complicated by active pulmonary and extrapulmonary tuberculosis has been a challenging problem. Because of the high mortality rate, obstetricians hesitated to allow the tuberculous patient the privilege of childbearing. Tuberculous pericarditis, in particular, has been, with few exceptions, a fatal disease.[4-16] The prognosis in such cases, has, since the advent of streptomycin, been much improved.[17-19] The occurrence of tuberculosis of the pericardium in pregnancy has not, to our knowledge, been previously reported. The case reported in this paper is the first of its kind to be treated with streptomycin during pregnancy with apparent cure.

With the use of streptomycin, the outlook for these patients has completely changed. As this report shows, active tuberculous lesions in the lungs and kidneys can be successfully treated. It remains to be determined whether this dramatic improvement represents a definite cure or a remission of the disease. Only a larger series and longer follow-up can answer this question.

Another problem to be answered is the effect of the drug on the fetus. From the meager reports in the literature, substantiated by the findings in our cases, it seems that toxic reactions are minimal or absent. Again, a larger number of observations will be of help in determining the importance of this factor.

Summary

1. Five pregnant patients with pulmonary and extrapulmonary tuberculosis treated with streptomycin during varying periods of their gestation were reported.

2. Dramatic improvement in the clinical condition of all patients was observed.

3. Streptomycin did not produce apparent toxic effect in mothers or infants.

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EDEMA FLUID PROTEIN IN PATIENTS WITH TOXEMIA OF PREGNANCY

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THE etiology of the eclampsia-pre-eclampsia syndrome, as well as the physiopathological processes causing most of the signs and symptoms associated with it, remains obscure. Dieckmann[1] recently pointed out that most investigators believe that eclampsia-pre-eclampsia is a clinical entity in which there is primarily a water and salt retention in the tissues due to an abnormal increase in the capillary permeability.

It would seem logical that if the capillaries were damaged by some toxin or tissue-damaging factor there would be abnormal amounts of protein escaping through the capillary walls into the tissue spaces. Dexter and Weiss,[2] Helmuth,[3] and Albano[4] have investigated the protein content of the edema fluid of pregnant patients using a refractrometric method of determination. Little other data regarding this is available.

It was the purpose of this investigation to measure the edema fluid proteins of patients with the eclampsia-pre-eclampsia syndrome, using a photoelectric method[5] which differs in some essentials from that used in previous studies.

Methods

Edema fluid was obtained by inserting a small Southey tube into the subcutaneous tissue of an edematous area. The tube was introduced just below and parallel to the skin. There was usually a free flow of edema fluid through the lumen of the tube sufficient to charge a 0.1 c.c. pipette. Occasionally the local tissue pressure was increased by stretching the skin of the part or by exerting gentle pressure 2 or 3 cm. from the tube. If the fluid was not perfectly clear and grossly free of erythrocytes, the Southey tube was removed. Another area was then selected and another tube inserted.

The end of the charged pipette was wiped to remove excess fluid and the contained fluid was blown into 8 c.c. of 2.5 per cent sulfosalicylic acid in a standardized colorimeter tube. The percentage of light transmission was then read in a photoelectric colorimeter (Lumetron 400) at a wave length of 420 μ. A blank tube filled with 2.5 per cent sulfosalicylic acid was used for comparison.

The percentage of protein was determined by reference to a standard curve previously prepared from blood serum of known protein content.[5]

Two patients with eclampsia, seventeen patients with pre-eclampsia and one patient with polyhydramnios were examined. No effort was made to collect edema fluid in patients who did not show clinical edema. Cases 3, 9, 12, and 18 are probably best classified as toxemia based on hypertensive cardiovascular disease. Edema fluid was collected from the ankle or calf of the lower extremities only.

In Table I are tabulated the results of these studies.

TABLE I. PROTEIN CONTENT OF EDEMA FLUID FROM LOWER EXTREMITIES OF PATIENTS WITH TOXEMIA OF PREGNANCY

DIAGNOSIS	CASE	PATIENT	BLOOD PRESSURE	ALBUMIN	EDEMA OF ANKLES	SERUM PROTEIN	BLOOD URIC ACID	PROTEIN CONTENT EDEMA FLUID
Eclampsia	1	W. M. No. 68025	200/110	4 plus	4 plus		4.8 mg. %	.11 Gm. %
	2	M. B. No. 64964	140/100	2 plus	1 plus	T 6.95 Gm. A 5.50 Gm. G 1.45 Gm.	4.6 mg. %	.25 Gm. %
Severe pre-eclampsia	3	I. S. No. 64854	180/110	0	2 plus	T 7.48 Gm. A 5.29 Gm. G 2.19 Gm.	2.5 mg. %	.30 Gm. %
	4	M. S. No. 9269	170/110	2 plus	2 plus	T 6.91 Gm. A 5.10 Gm. G 1.81 Gm.	4.0 mg. %	.25 Gm. %
	5	A. K. No. 66276	220/120	4 plus	3 plus	T 6.43 Gm. A 5.00 Gm. G 1.43 Gm.	1.7 mg. %	.17 Gm. %
	6	E. H. No. 6666	160/100	3 plus	4 plus	T 6.56 Gm. A 5.17 Gm. G 1.39 Gm.	4.1 mg. %	.26 Gm. %
	7	L. G. No. 17292	140/100	3 plus	2 plus			.15 Gm. %
	8	F. B. No. 71573	154/92	3 plus	3 plus	T 6.36 Gm. A 4.45 Gm. G 1.91 Gm.	4.0 mg. %	.15 Gm. %
	9	A. W. No. 66325	170/100	0	4 plus	T 6.40 Gm. A 4.81 Gm. G 1.59 Gm.	2.3 mg. %	.27 Gm. %
Mild pre-eclampsia	10	L. W. No. 19224	132/100	1 plus	4 plus	T 6.03 Gm. A 3.87 Gm. G 2.16 Gm.	4.0 mg. %	.12 Gm. %
	11	R. L. No. 16938	170/110	2 plus	4 plus	T 6.77 Gm. A 5.15 Gm. G 1.62 Gm.	3.2 mg. %	.23 Gm. %
	12	R. S. No. 27502	200/100	0	4 plus	T 6.53 Gm. A 4.92 Gm. G 1.61 Gm.	2.4 mg. %	.10 Gm. %
	13	S. T. No. 25006	140/85	1 plus	4 plus	T 7.23 Gm. A 5.16 Gm. G 2.07 Gm.	2.7 mg. %	.21 Gm. %
	14	F. A. No. 40237	156/94	2 plus	2 plus	T 5.71 Gm. A 4.36 Gm. G 1.35 Gm.	4.0 mg. %	.37 Gm. %

	15	J. M. No. 69053	200/140	2 plus	4 plus	T 7.75 Gm. A 5.50 Gm. G 2.25 Gm.	3.6 mg. %	.18 Gm. %
	16	M. G. No. 64853	140/100	2 plus	2 plus	T 6.56 Gm. A 4.73 Gm. G 1.83 Gm.	2.9 mg. %	.36 Gm. %
	17	M. C. No. 66286	185/115	2 plus	2 plus	T 7.61 Gm. A 6.51 Gm. G 1.10 Gm.	3.7 mg. %	.19 Gm. %
	18*	B. H. No. 2551	170/110	1 plus	1 plus			.48 Gm. %
	19	L. P. No. 59889	112/60	2 plus	1 plus	T 7.11 Gm. A 4.76 Gm. G 2.35 Gm.	2.7 mg. %	.22 Gm. %
Polyhydramnios	20	A. M. No. 68527	128/80	1 plus	4 plus	T 6.91 Gm. A 4.88 Gm. G 2.03 Gm.	5.2 mg. %	.26 Gm. %

*Twelve hours post partum.

As can be seen from reference to the table, the average protein content of edema fluid in twenty cases of toxemia of pregnancy was 0.23 Gm. per cent. The maximum amount of protein found in the edema fluid of toxemic patients was 0.48 Gm. per cent. The smallest amount of protein found in the edema fluid of toxemic patients was 0.10 Gm. per cent.

Comment

Stead and Warren,[7] using a Micro-Kjeldahl method,[6] found that the filtrate from the capillaries of the skin and subcutaneous tissues normally contains some protein, probably less than 0.24 Gm. per cent.

Comparable values have been found in the edema fluid of patients with congestive heart failure[5, 7, 8] and in renal disease such as acute nephritis.[9] Maximum amounts of edema-fluid protein have been found where there is capillary damage such as occurs in an arsenical reaction or in a local inflammatory condition.[5] Acute infectious disease, fever, and generalized anoxemia apparently cause no abnormal increase in permeability to protein in the capillaries of the leg.[7] Helmuth[3] and Albano[4] found that the edema fluid in pregnant patients with edema contained less than 0.4 Gm. per cent of protein. Albano[4] found higher values in patients with renal disease and suggested that determination of edema fluid proteins might have some diagnostic value. Dexter and Weiss[2] studied six cases of pre-eclampsia and one case of eclampsia and found the protein content of the edema fluid to be less than 0.3 Gm. per cent. Refractrometric methods were used in these studies.

In the present study of twenty patients suffering with toxemia of pregnancy a low protein content of the edema fluid was found. These results agree with those reported by other investigators and are an indirect indication that capillary permeability to protein in the lower extremities is not increased in most instances in the course of toxemia of pregnancy.

Summary

1. Studies of protein content of edema fluid of the lower extremities in twenty cases of toxemia of pregnancy are presented.

2. The protein content of edema fluid in these patients varied from 0.10 Gm. per cent to 0.48 Gm. per cent, with a mean of 0.23 Gm. per cent.

3. There is apparently little if any increase in the capillary permeability to proteins in the lower extremities in the course of toxemia of pregnancy.

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A RAPID ASEPTIC SCRUB TECHNIQUE FOR NURSERIES OF THE NEWBORN*

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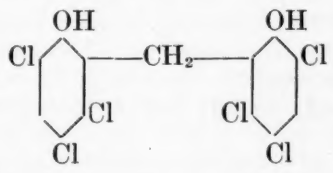
THE prevention of infection of the newborn in the nurseries of maternity units has necessitated the development of techniques which maintain the isolation of babies from each other and from outsiders, in so far as possible. In the case of the premature infant these isolation precautions are mandatory, for it is this group of babies which is particularly prone to infection. Hence, any method which will provide better isolation precautions and improved aseptic technique in the care of the newborn is very desirable. In the general care of the infant, both in "rooming-in" plans and in the standard methods of nursery care, one nurse must be responsible for a number of babies. Proper masking of the nurse's face and the preparation of the hands between the handling of each have been considered essential to sound nursery technique. Correct masking can always be attained and properly supervised, but hand washing may often be perfunctory and so inadequate that it does not remove the risk of contamination from baby to baby. This propensity of the human skin to carry pathogenic and nonpathogenic organisms from individual to individual has always been a major hazard in a maternity hospital in the care of the parturient as well as her infant. Techniques capable of sterilizing the skin have been either injurious or time-consuming. Hence in any situation where frequent and prolonged scrubbing of the hands is necessary, as is required in nursery care, the fear of producing trauma to the skin or the desire to save time will occasionally result in a break in technique. The purpose of this paper is to present a scrub technique of hand care for use in newborn and premature nurseries which will help to eliminate some of the above-mentioned hazards. In addition to the clinical aspects of the study, controlled bacteriological studies will be presented.

Traub[1, 3] and Guild[2] have reported a marked and prolonged reduction in the bacterial flora of the skin of the hands following the use of a relatively new phenol compound incorporated in a detergent base. This compound, termed hexachlorophene, is 2,2′-dihydroxy-3,5,6,-3′,5′,6′-hexachloro-diphenylmethane, and has the structural formula:



*This study was made possible by a grant from Winthrop-Stearns, Inc., N. Y.

For the purposes of this study a 3 per cent concentration of hexachlorophene was incorporated in a liquid detergent* which was substituted for ordinary soap in the usual scrub technique. This material will be referred to as G-11 in pHisoderm.

Methods

The subjects for study were student and postgraduate nurses who were on routine nursery duty at the Boston Lying-in Hospital. The following methods were employed:

Technique I.—Aluminum basins 16 inches in diameter, nested and autoclaved in sets of three, were set out in the nursery for the use of the subjects. Two liters of tap water were placed in each basin. Between scrubs the brushes used were kept soaking in a 1:1,000 aqueous solution of Zephiran in brush pans at the scrub sink. Every other day the brushes and brush pans were boiled and the antiseptic solution was replaced with new solution. Control cultures of the tap water taken during three different months revealed an average growth of only two colonies per sample, with a maximum of five. It was felt that this small error would not materially influence the results of the study.

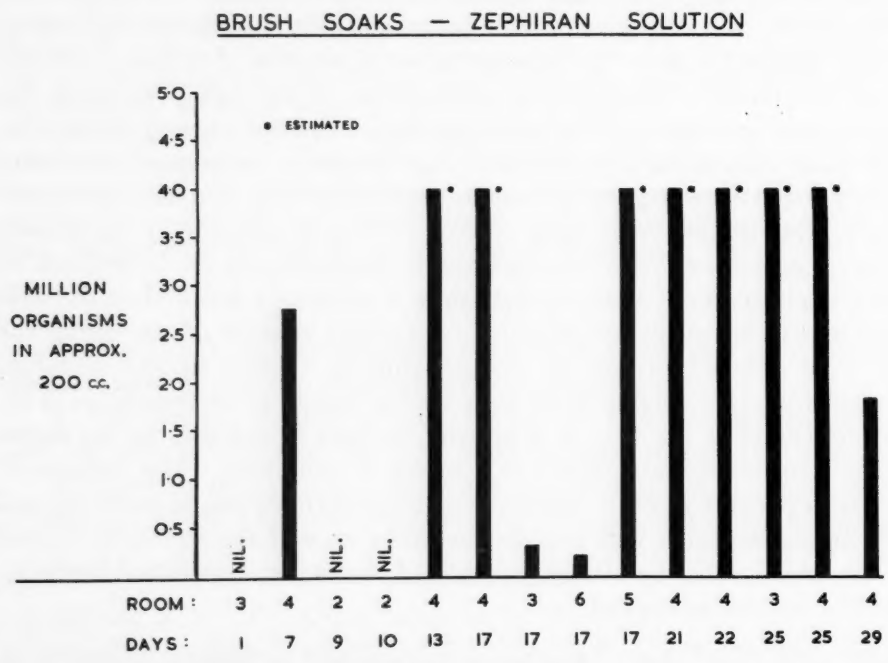


Fig. 1.—Estimated number of bacteria from an antiseptic solution (aqueous Zephiran 1:1,000) into which brushes were redeposited after each scrub.

Each nursery nurse when arriving on duty, returning from meals, between diapering or handling of babies, for her first three days scrubbed her hands and arms for one minute with liquid soap in each basin, making a total scrubbing time of three minutes (Table I, Group A). The change was then made to G-11 in the detergent pHisoderm, and for the rest of her time in the study the subject used this material exclusively for all her scrubbing and washing while on duty (Table I, Group B).

*The detergent used was pHisoderm, manufactured and supplied by Winthrop-Stearns, Inc. This is composed of a sulfonated ether, petrolatum, lactic acid, and wool fat cholesterols. It has good emulsifying, sudsing, and dispersing properties; has been found to depress the surface tension of water more than soap; has good emollient properties and consequently is not drying to the skin; has a pH of 5.5; is not a primary irritant; is hypoallergenic.

TABLE I. TECHNIQUE I
BEFORE BRUSHES WERE AUTOCLAVED

I. GROUP A—SOAP SCRUB

Basin	*Average bacterial counts on 40 subjects*
1	46,800,000 per basin
2	11,300,000 per basin
3	6,600,000 per basin

II. GROUP B—SCRUB WITH PHISODERM CONTAINING 3% G-11

Basin	*Average bacterial counts on 42 subjects*
1	11,400,000 per basin
2	6,600,000 per basin
3	2,700,000 per basin

Cultures were obtained by taking 0.1 c.c. sample of scrub water from each basin immediately following the subject's scrub with soap or with pHisoderm using a sterile graduated 0.1 c.c. pipette. Each sample was placed immediately in a sterile Petri dish, mixed with 10 c.c. of liquefied tryptic digest agar, allowed to solidify, and incubated at 37° C. for forty-eight hours, following which colony counts were made. Frequent control cultures were taken from the antiseptic brush-soak solution.

Technique II.—A freshly autoclaved brush was used for each scrub, eliminating the brush soaks entirely. The routine followed was the same as in Technique I.

TABLE II. TECHNIQUE II
AFTER BRUSHES WERE AUTOCLAVED

I. GROUP A—SOAP SCRUB

Basin	*Average bacterial counts on 30 subjects*
1	827,000 per basin
2	434,000 per basin
3	410,000 per basin

II. GROUP B—SCRUB WITH PHISODERM CONTAINING 3% G-11

Basin	*Average bacterial counts on 24 subjects*
1	360,000 per basin
2	44,000 per basin
3	43,000 per basin

Technique III.—This was simplified in order to include a larger number of subjects. A single basin, instead of three, was used by each subject. Each subject's time in the study was divided into four periods, as follows:

1. The first period consisted of using the ordinary liquid soap for three days for each three-minute scrub. During this time each subject scrubbed for three minutes when first coming on duty, at which time cultures of the scrub water were taken. Additional scrubs were required throughout the working day, such as after diapering babies, after returning from classes, meals, etc. Cultures were repeated at the postdiapering scrub.

2. The second period was for three days' duration, using 3 per cent G-11 in pHisoderm in place of soap but with no change in scrub technique.

3. The third period was for three days' duration, using pHisoderm reinforced with G-11, but with the scrub time reduced, as recently advocated by Walter.[4] Such a scrub requires that each skin area of hands and forearms be covered with only nine brush strokes; with practice this reduces the necessary scrubbing time to approximately ninety seconds. In this study this scrub was carried out when the subject first came on duty and was repeated once during the day at the end of a diapering period. Cultures were taken at both times. At all other times, when a scrub would have been required by the previous

technique, i.e., after return from classes or meals, simple washing of the hands with G-11 in pHisoderm was used. This resulted in much saving of time and eliminated the hazard of skin trauma from frequent scrubbing.

4. The fourth period was a return to the routine of period 1, namely, soap scrubs for ten days, following which cultures were taken in the manner previously described.

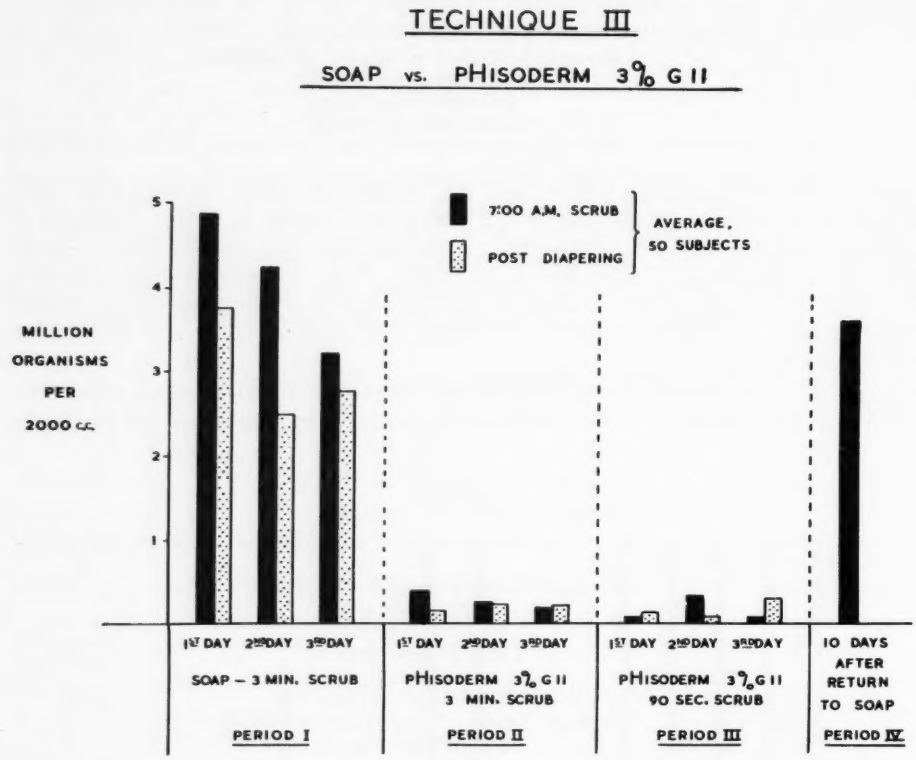


Fig. 2.—A comparison of bacterial counts from surgical hand scrubs done with soap and with pHisoderm containing 3 per cent G-11.

Results

The initial phase of this study was to determine the value of the routine scrub, comparing ordinary soap with a detergent, pHisoderm, containing 3 per cent hexachlorophene, or G-11. In addition to cultures of the scrub water, cultures were taken from the solution (aqueous Zephiran 1:1,000) in which the brushes were kept between scrubbings. Fig. 1 reveals the marked contamination of this solution resulting from such technique. With this method of brush care, very high bacterial counts were obtained from the scrub water, regardless of whether soap or G-11 with pHisoderm was used (Table I).

As shown in Table II, Group A and B of Technique II, there was a marked decrease in bacterial counts when the brushes were autoclaved and a fresh brush used with each scrub. In addition it will be noted that when the pHisoderm with G-11 scrub was substituted for the soap scrub, there was a reduction in the bacterial count in Basin 1 of 56 per cent, and a reduction in the bacterial counts in Basins 2 and 3 of 89 per cent each.

A still greater reduction in bacterial counts was obtained in the third phase of this study, period 1 vs. period 2, as is shown in Fig. 2. This marked reduction was well maintained with pHisoderm and G-11 in period 3, when the

number of daily scrubs and the length of time of each were decreased. When soap was used again for ten days (period 4), in place of pHisoderm and G-11, the bacterial colony counts returned to their previous high levels.

Of the one hundred sixteen subjects who used pHisoderm and G-11 in this study, and the many other persons in the hospital who have since used this material for scrubbing purposes, only one reported any skin irritation from its use, and this was an entirely subjective complaint. No actual dermatitis was demonstrable. Many subjects reported that their hands remained free of irritation, although they had often suffered a dermatitis when scrubbing frequently with soap.

Comment

This study was undertaken to compare the effectiveness of an ordinary liquid soap scrub with that of a synthetic detergent combined with a relatively new phenol derivative, hexachlorophene, for the removal of surface organisms from the hands and to determine whether it has any bacteriostatic properties.

It was found that liquid soap used in three-minute scrubs at frequent intervals during the day had some cleansing effect, but did not significantly reduce the number of organisms removed from the skin as determined by culturing the scrub water. Furthermore, there was no reduction of organisms noted from day to day or from scrub to scrub. By contrast, G-11 and pHisoderm employed in the same way greatly reduced the number of organisms present in the scrub water, after one or two days of use, and maintained this reduction from one scrub to the next and even overnight. It was also found that the length of scrub could be reduced to ninety seconds' duration and that the number of scrubs during an eight-hour period of duty could be reduced from six or eight to two or even one without reducing the effectiveness of the agent. Not only was the skin of the hands made surgically clean bacteriologically but this cleanliness could be maintained by fewer and shorter scrubs.

An incidental finding was that the antiseptic solution used for brush soaks and supposedly bactericidal was in fact unable to prevent the continued life and growth of organisms removed from the hands during scrubbing. This is a method of brush care which is frequently used, but from the results of this study this technique would appear to be dangerous. The autoclaving of brushes between scrubs is strongly recommended and a properly sterilized brush should be used for each individual scrub.

It is felt that as a result of this study G-11 combined with pHisoderm can be used to advantage as the routine cleansing agent for scrubbing the hands of all nurses, doctors, and others working regularly in nurseries of the newborn.

All personnel working daily in the nurseries who wish to use this method should substitute pHisoderm reinforced with G-11 for the ordinary soap but should not otherwise change their technique for the first two or three days following the change. Thereafter, they may use the short scrub (referred to as the ninety-second scrub) as previously described once each day when first coming on duty, at all other times simply washing the hands with pHisoderm and G-11. Personnel who enter the nurseries only occasionally, and who use pHisoderm and G-11 instead of soap, should not otherwise change their technique of hand preparation but should be required to scrub their hands a minimum of three minutes.

Summary

1. The results are presented of a study based on bacteriological data to determine the effect of a new soap substitute.

2. This material, hexachlorophene and pHisoderm, is a safe agent for hand scrubbing. It appears to have a remarkable bacteriostatic action when used regularly.

3. A rapid aseptic scrub technique employing this material for cleansing the hands is outlined for the use of personnel working in nurseries of the newborn.

Our thanks are gratefully extended to the many nurses of the Boston Lying-in Hospital without whose assistance and cooperation this study would not have been possible.

We also gratefully acknowledge the assistance given by Dr. Duncan E. Reid and Dr. Carl W. Walter.

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QUESTIONABLE NECESSITY OF THE CORPUS LUTEUM

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THE necessity of the corpus luteum for maintenance of early human gestation generally has been assumed to be true. Apparently this conclusion had its origin following the work of Fraenkel[3] half a century ago when he produced abortion in rabbits by removal of the corpus luteum. Since then, however, there have been instances reported where early removal of the corpus luteum has failed to alter the normal progress of the human pregnancy.

Such reports not only have become more numerous, but also have demonstrated the ability of the pregnancy to survive after removal of the corpus luteum at relatively earlier and earlier stages of the gestation period. Outstanding among these reports have been those of Jones and Weil,[5] Pratt,[6] Douglass,[1] and Gruenewald.[4] More recently, Dunlap[2] reported removal of the corpus luteum fifty-seven days after the onset of the last menstrual period. This case proceeded to term uneventfully without the aid of hormone therapy, and with eventual delivery of a normal infant.

Obviously, in view of these reports and the additional case reported herein at an even earlier stage of gestation, there should exist a question as to the necessity of the corpus luteum for maintenance of early human gestation. If pregnancy can survive without a corpus luteum in the first trimester before the placenta has taken over hormone production, one must postulate either another source of hormone production or else conclude that the corpus luteum hormone is not essential to the survival of the pregnancy.

The next logical step is to question the rationale of hormone therapy in cases of threatened abortion. It is difficult to justify the administration of estrogens or progesterone to help maintain a pregnancy when complete absence of the accepted source of these hormones fails to alter the normal progress of the pregnancy.

Mrs. B. K., aged 32 years, a white para i, gravida ii, was seen May 27, 1949, complaining of a left-lower-quadrant pain. This was dull, nonradiating, intermittent in nature, and had been present several days.

The last menstrual period was April 21, 1949, and the patient computed on the basis of previous menstrual periods, which were always regular, that she was approximately one week overdue. At the time of the missed period, there had been slight staining. The only other complaint was moderate urinary frequency.

Past history included a normal full-term pregnancy twenty months previously. There had been no major illnesses and no surgery in the past.

Physical examination revealed no abnormal findings except for moderate tenderness in the left lower quadrant. Pelvic examination disclosed a closed soft cervix, a slightly enlarged soft uterus pushed to the right and a 6 cm. soft, tender mass in the left adnexal area. Laboratory reports of blood and urine were within normal limits.

A tentative diagnosis was made of early intrauterine pregnancy with left ovarian cyst. A left tubal pregnancy was also considered possible. The patient was placed under observation temporarily inasmuch as her condition was good and she was in no great discomfort. However, during the next three days the left-sided pain became progressively more severe and since a tubal pregnancy could not be ruled out, it was decided to operate.

Under spinal anesthesia, a low transverse incision was made. The uterus was very slightly enlarged and soft. Both tubes were normal. The right ovary was small and firm with no evidence of luteal tissue. The left ovary was replaced by a cyst approximately 6 cm. in diameter. This was removed along with the appendix and the abdomen closed.

Pathology report was as follows:

Gross Description.—

Ovary: The ovary measures 6 cm. in greatest extent. It is thin-walled and cystic. At one pole it is roughened, showing evidence of dissection. A nodular elevation on one aspect has been incised exposing a corpus luteum. The corpus luteum forms a small cyst measuring 2.5 cm. in greatest extent. The remainder of the ovary consists of a large cyst with a wall of maximal thickness of 1 mm. The large cyst contains a clear, translucent fluid. The inner lining is smooth and shiny. A small amount of mucoid material is present within this cyst. There is some yellowish stain in the wall of the cyst.

Appendix: The appendix is comma shaped and measures 3 cm. in length by 0.7 cm. in greatest thickness. There is a clamp mark at the base and a small amount of fat in the mesoappendix. The serosa is smooth and shiny. Multiple transverse sections disclose the lumen to be tiny and the major portion and the distal portion cannot be identified definitely. The mucosa and muscularis are moderately thick.

Microscopic Description.—

Ovary: Two sections show portion of a large corpus luteum with slight organization of the central blood clot. The central portion appears moderately cystic. A third section shows a few fibrous adhesions on the surface. There is moderate compression of the stroma with slight edema. There is portion of a large cyst lined by flattened cuboidal cells characterized by small dark nucleus and a moderate amount of acidophilic cytoplasm. Nothing remarkable is otherwise noted.

Appendix: Two sections. The lumen is small. The wall is of average thickness. The lymphoid tissue is moderate in amount. The outer coats show nothing remarkable. A third section shows complete obliteration of the lumen but otherwise nothing additional.

Diagnosis.—

Serous cystoma, active corpus luteum of the ovary. Focal obliteration of the lumen of the appendix.

This cyst was removed forty-one days after onset of the last menstrual period. One dose of Demerol, 100 mg., was given postoperatively on the day of surgery because of abdominal pain. No other sedatives and no hormones were administered. The patient had bathroom privileges on the day following surgery and was discharged from the hospital on the fifth postoperative day.

The subsequent prenatal course was uneventful except for one episode of spotting early in the seventh month. This was controlled by bed rest for twenty-four hours.

On Jan. 23, 1950, she was delivered of a normal 7 pound, 9½ ounce male infant with the aid of prophylactic low forceps and an episiotomy. This was nine months and two days after the last menstrual period.

Summary

Removal of the corpus luteum in early pregnancy, forty-one days after onset of the last menstrual period, does not necessarily result in abortion. In the case reported, the patient successfully carried to term without the aid of any hormone therapy.

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PRIMARY OVARIAN PREGNANCY*

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MRS. L. S., aged 30 years, was admitted to hospital, on the evening of Oct. 5, 1946, with the chief complaint of lower abdominal pain. The patient was married 7 years, para i, delivered in June, 1944.

The last normal menstrual period began on Aug. 12, 1946. On September 27, she developed "spotting," followed in two days by the passage of clots. For one week prior to her admission she had suprapubic pain lasting for varying intervals and the "spotting" persisted until her admission. On the morning of Oct. 5, 1946, she had an attack of severe pain, deep in the pelvis; she had two bowel movements and vomited once. Two hours before being brought to the hospital, the lower abdominal pain subsided and she developed right shoulder pain.

Palpation of the abdomen revealed moderate rigidity of the muscles of the right lower abdomen and flank. Rebound tenderness was present and the pain was referred to the suprapubic region and the right shoulder. The patient was not in shock, but a noticeable palor was observed.

The closed cervix revealed a healed stellate laceration; there was a small amount of blood-stained mucoid secretion from the os. The uterus was small, anterior in position, mobile, and somewhat tender to palpation. There was a soft doughy mass palpable in the right adnexal area which was extremely tender, and movement of the cervix with the examining finger produced excruciating pain referred to the right lower abdomen. There was no enlargement, but slight tenderness of the left adnexa.

The temperature on admission was 99.3° F., the pulse 100, and respirations 20. The blood pressure at this time was 120/80, red blood cells 3,470,000, hemoglobin 65 per cent, white blood cells 10,000. Urinalysis was negative. Sedimentation rate showed a drop of 24 mm. in 60 minutes. Two hours later, in addition to the above findings, there was shifting dullness on percussion of the abdomen; temperature 100.2° F., pulse 134, and the blood pressure had dropped to 95/60.

In view of the history and physical findings, a diagnosis of ruptured ectopic (tubal) pregnancy was made and the patient was made ready for immediate operation.

Operation.—Laparotomy on Oct. 5, 1946. The abdominal cavity contained approximately 600 c.c. of free blood and recently formed clots. The right tube was absolutely normal in appearance and free from any adhesions along its entire length including the frimbriated extremity. On the posterior surface of the broad ligament, entirely separated from the tube and obscuring the ovary, was a recently formed clot approximately 6 to 8 cm. in diameter. The clot was cleared away and the ovary presented a hemorrhagic cyst with point of rupture. The cyst-bearing portion was at the medial pole of the ovary and was about 2½ cm. in diameter. The ovary was resected, a wedge-shaped piece of tissue

*Presented at a meeting of the Obstetrical Society of Philadelphia, Jan. 6, 1949.

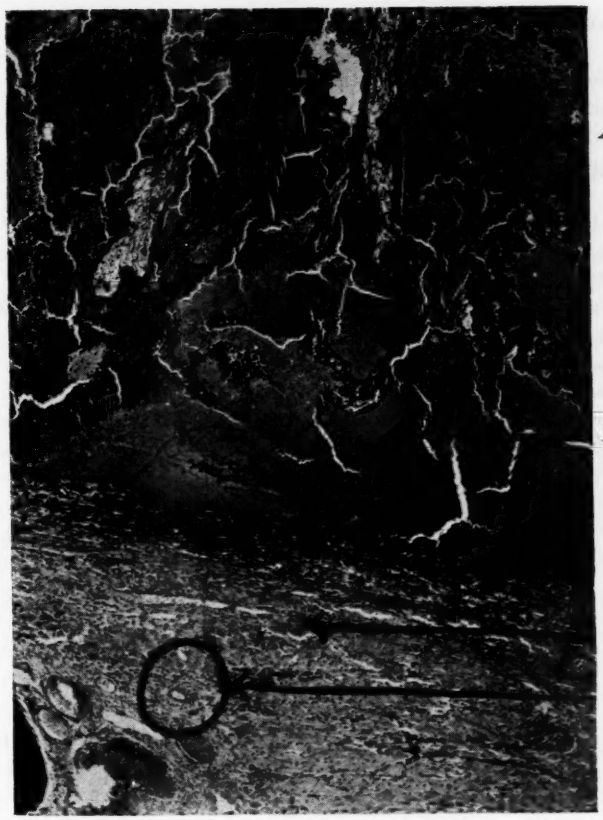

Fig. 1.—Section of specimen (×33) showing:
A, Chorionic villi;
B, Area of hemorrhage;
C, Ovarian stroma;
D, Decidual reaction.

Fig. 2.—Circled area marked *D* in Fig. 1, showing decidual reaction. (×500.)

including the hemorrhagic cyst was excised, and the cut surface of the ovary was sutured with fine catgut. The left tube and ovary were inspected and found to be normal. The abdomen was closed. During the operation, the patient received 500 c.c. of 5 per cent glucose in normal saline and 500 c.c. of compatible blood.

Diagnosis at this time was a possible ovarian pregnancy.

The Friedman test and the rat test for pregnancy taken upon admission were both reported positive. Serology was negative. The patient made an uneventful recovery and was discharged on the twelfth postoperative day.

Pathologic Report.—Macroscopic examination: The specimen consisted of a circular mass of tissue, 2½ cm. in diameter and on cut section is filled with coagulated blood. Microscopic examination: The section consists of ovarian tissue. There is a large corpus luteum present. There is a mass of hemorrhage in the ovary, some decidual reaction, and numerous chorionic villi. The ovarian vessels are markedly congested.

Diagnosis.—Ovarian Pregnancy.

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METASTATIC CARCINOMA OF THE CLITORIS

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SECONDARY carcinoma of the clitoris is an extremely rare entity, so rare in fact, that a comprehensive review of the literature pertaining to metastatic carcinoma of the cervix failed to reveal a single reference to this condition.

The patient, a 45-year-old white woman, consulted her physician primarily because she noticed a rather rapid increase in the size of the clitoris. She stated that this became apparent approximately six weeks previous to admission, but the greatest expansion had occurred during the past two weeks. Although admitting that she had not felt entirely well during the past six months, she was somewhat vague about the exact time of onset. At the time, she began to have dull, aching pains in both flanks, worse on the right, later developing a persistent pain in both legs. The patient enjoyed excellent general health until the onset of the present illness. Menstruation was regular, usually occurring every twenty-eight days, moderate in amount and not associated with any clots. Moreover, she related that she has noticed no intermenstrual bleeding or any increase in vaginal discharge. Further interrogation disclosed a lack of dyspareunia while she emphatically denied any postcoital bleeding. The patient had been married for a period of nine years, with no resultant pregnancies. A careful inquiry failed to reveal any symptoms referable to disease of the cardiorespiratory, gastrointestinal or genitourinary tracts.

Physical examination revealed temperature, 98.6° F.; pulse, 76; respiration, 20; blood pressure, 122/84; weight, 128 pounds; red blood cells, 4,500,000; white blood cells, 12,950; hemoglobin, 86 per cent; blood sugar, 80.0; Kahn test, negative; nonprotein nitrogen, 23.8; urine analysis: acid, 1,020; sugar, negative; albumin, trace; microscopic, white blood cells, 10-12. The patient was rather well developed and in no apparent distress. She was cheerful, alert, and cooperative. General examination was essentially negative, being relevant primarily from a gynecological standpoint.

The clitoris was markedly hypertrophied, measuring 3 cm. in length with a diameter of 1 cm. at its base. It was rather hard, cartilagenous in consistency, and fairly well fixed, being conical in shape with slight convexity upward, the tip terminating in a rather sharp point. Careful investigation of the vulva and inguinal region disclosed no evidence of any tumor masses or enlarged nodes. When the vulva was separated, a moderate amount of purulent discharge was present and introduction of the fingers into the vagina initiated a good deal of bleeding. The distal portion of the vagina felt somewhat stenosed, this apparently stemming from many friable adhesions in this area. When these were separated gently, the resultant bleeding became quite protracted. In the distal portion of the vagina, one could outline an extensive cauliflower-like, vegetative growth involving the entire vault. Speculum examination showed that the entire cervix was replaced by a fungating, papillary tumor growth which extended to the vaginal wall in all directions. The uterus was quite small, normal in shape, position, and contour, and practically immobile, being fixed in the pelvis. In both adnexal regions, one could palpate irregular, adherent, small masses which seemed to involve the adnexa, parametrium, and broad ligament in a rather extensive, infiltrating process, resulting in a frozen pelvis.

Under sodium pentothal anesthesia, multiple punch biopsies of the cervix were obtained and the clitoris amputated in a guillotine fashion. All bleeding points were carefully ligated, after which the skin of the vulva was sutured over the stump. Gelfoam gauze was carefully

placed against the cervix and the vagina packed with gauze sponges. The patient's postoperative course was entirely uneventful and she was discharged in good condition.

Pathological Report, Gross.—Specimen consists of three small fragments of tissue, the largest measuring 1.5 by 1.5 by 1 cm. The surface of this mass is irregular and of a lightish brown color. On cut section, it was found to contain a round tumor mass, measuring about 0.75 to 1 cm. in diameter. This tissue is of a firm consistency and of a white homogeneous color.

Pathological Report, Microscopic.—No erectile tissue is seen in any of the sections examined, except perhaps in the larger one which is all but obliterated by a neoplastic mass consisting of very poorly differentiated cells which appear to be of the epidermoid type. These show much nesting in and about what could be an erectile stroma but the cells completely fill it and replace it and result in no remaining visible pattern which could be diagnostic. There is no tendency toward the introduction of a definite epithelial pattern, although in some areas the lesion could be construed as being either of the transitional or squamous type; however, the differentiation is very poor. Tumor cells are seen in lymphatics and in one area along the border neoplastic tissue is apparently found within a blood vessel. A second small fragment of tissue reveals a moderate squamous-forming tendency; however, this is not clear. The lesion is accompanied in the smaller specimen by considerable lymphocytic infiltration. In many areas, vacuolization of the neoplastic cells is present and many bizarre forms are also seen which could possibly suggest a radiation effect. Necrosis is also present in the vicinity of the lymphoid infiltration.

Pathological Diagnosis.—Squamous-cell carcinoma, Grade IV.

The patient is now receiving radium and deep x-ray therapy, but the prognosis obviously is very grave.

605 Medical Arts Building

POLYARTERITIS NODOSA INVOLVING THE FEMALE GENITAL TRACT

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DURING the past fifteen years the syndrome of polyarteritis nodosa has provoked much interest, and the number of cases reported has steadily increased. Polyarteritis nodosa is no longer a pathological curiosity. This is undoubtedly due to a better understanding and correlation of the fundamental lesions and their clinical manifestations. Etiological hypotheses by Rich,[1] and the linkage of the malady with the so-called collagen diseases, have offered much for immunological, clinical, and therapeutic investigation.

Polyarteritis has potentialities of producing varied manifestations as evidenced by the reports of Felsen,[2] Higgins,[3] Diaz-Rivera and Miller,[4] Logue and Mullins,[5] McCall and Pennock,[6, 7] and Harris, Lynch and O'Hare.[8] The symptomatology may be diffuse and bizarre, since the basic lesion is a necrotizing arteritis which may affect all systems.

In the literature reviewed, the organs most frequently affected are those of the urinary, cardiovascular, gastrointestinal, and nervous systems. Although lesions of the testes are not uncommon, and involvement of the uterus has been noted,[4, 9] mention of diffuse involvement of the female genital tract has not been found in the literature reviewed. A case presenting such lesions, as well as in other systems, is therefore worthy of mention.

Clinical Summary.—M. P., a 61-year-old white woman, was admitted to the Mercy Hosppital through the emergency room on Aug. 4, 1949. The patient was comatose. A brief history from a friend revealed that she had experienced frequent (three) hematemeses of moderate quantity (½ drinking glassful) for twenty-four hours prior to admission. There was no knowledge of antecedent gastrointestinal symptomatology, and the patient was believed to be in good health except for a mild upper respiratory infection and a chronic arthritis involving the joints of the lower extremities. Communication with the family physician revealed that he had prescribed Enseals of sodium salicylate, 10 grains, three times a day, for the past three days because of the upper respiratory infection and the arthritis which he considered to be chronic in nature. No other drugs were prescribed or evidently taken.

The patient was well developed and well nourished, but comatose. Rectal temperature was 101° F.; respirations 20; blood pressure 110/60; and pulse 110 of good volume and regular. Head and neck were negative except for the presence of dried blood on the lips. No local oral lesions were present. The lung fields were clear and the heart sounds of good quality. Examination of the abdomen was not satisfactory, yet no organs or masses could be palpated. There was no rigidity and peristalsis was active. Deep palpation of the abdomen caused the patient to move her arms and mutter incoherently. Localizing neurological signs were absent. The skin and skeletomuscular system showed no gross abnormalities.

The patient died minutes after the examination, before any therapy could be instituted.

Necropsy (Abstract of positive findings).—The significant necropsy findings were confined to the digestive, genitourinary systems, and spleen.

Digestive system: The esophagus and stomach contained a moderate amount of blood-tinged mucus and clot. The gastric mucosa was atrophic. Although the duodenum was free of any gross lesions, the remainder of the small intestine showed multiple (25) subserosal ecchymoses, the largest of which measured 1 cm. in diameter. The external surface of the large intestine was smooth and glistening and free of these vascular lesions. When the intestinal tract was opened, numerous submucosal and mucosal petechiae were present throughout. There were no perforations nor nodules in the visceral vessels.

Spleen: The organ weighed 175 grams. It was soft and the cut surface was typical of an acute toxic splenitis.

Urinary system: The combined weight of the kidneys was 300 grams. The capsules were thin and stripped with ease, revealing smooth, but pale, cortical surfaces studded with petechiae. The cut surfaces showed these vascular lesions to be limited to the cortices. The medullas appeared congested. Cortical and medullary substances were of normal quantity.

Internal genitals: The uterus was small. Its serosal surface was pale, but smooth and glistening. The myometrium showed moderate fibrosis with sclerotic vessels. Small petechiae were noted throughout the uterine musculature. The endometrial surface appeared atrophic. The cervix, Fallopian tubes, and ovaries grossly showed nothing of note. The latter were almond sized and fibrotic.

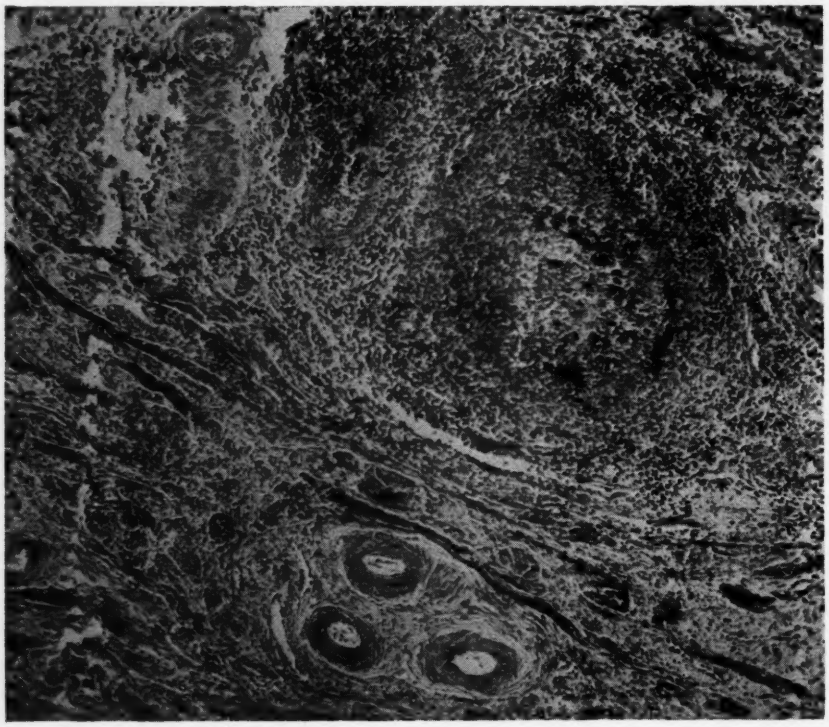

Fig. 1.—Photomicrograph showing vascular lesions of polyarteritis nodosa in uterus. Note also normal vessels in section.

Microscopic examination: The outstanding microscopic lesion was that of a rather acute necrotizing arteritis characterized by a dense inflammatory infiltration consisting of many lymphocytes, eosinophiles, plasma cells, and segmented neutrophiles. This infiltration was present throughout the adventitial, medial, and intimal zones of the small arteries and arterioles of the spleen, kidneys, gastrointestinal tract, and the uterus, cervix, and ovaries. Medial necrosis, as well as fibrinoid degeneration, was an outstanding feature of the lesions. Periadventitial hemorrhage and intimal thromboses were also present (Fig. 1). Microscopic study of the other organs showed no significant lesions.

Diagnosis: Acute polyarteritis nodosa with involvement of kidneys, spleen, intestinal tract, and uterus, cervix, and ovaries.

Comment

The clinical recognition of polyarteritis nodosa has become more frequent due to the awareness of its manifestations. Despite the fact that acute gastrointestinal symp-

tomatology due to this malady has been described,[2, 4, 8] nevertheless, one rarely coniders polyarteritis in the differential diagnosis of hematemesis, intestinal obstruction, or intestinal perforaation. It is, therefore, necessary that such manifestations receive adequate consideration in the differential diagnosis of acute abdominal emergencies.

Although Banowitch and associates[9] have reported on the occurrence of polyarteritis of the uterine vessel, also demonstrating similar lesions in other organs, they make no mention of symptoms referable to this organ. With involvement of ovaries and cervix as well as of uterus, which heretofore has not been reported, the possible symptoms referable to the female reproductive system become numerous. It becomes apparent that the gynecologist must look upon polyarteritis nodosa as a disease which may confront him, especially in the examination of women with gynecological complaints and associated bizarre systemic symptoms.

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PAPILLOMA OF THE CERVIX, ASSOCIATED WITH PREGNANCY*

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PREGNANCY results in hypertrophy of both the stromal and epithelial components of the cervix. Thus, Murphy and Herbut,[6] studying cervical biopsies of 50 pregnant women, found thickening of the squamous layer in all cases and increased activity of the basal layer in 6 per cent of the patients. Decidual formation was noted in 22 per cent. Similar observations were recently reported by Glass and Rosenthal.[3] These changes result from stimulation by estrogenic and pituitary hormones. Infection is a likely predisposing factor for acute and subacute inflammation and is often noted in the cervical stroma. At times the squamous lining of the cervix undergoes such extreme hypertrophy that significant pathological changes are produced. Edmondson and associates[2] emphasize papillary lesions of the cervix associated with pregnancy. They report 6 instances in women varying from 17 to 22 years of age. The lesions were encountered from the eighth week of pregnancy to the time of delivery. Single or multiple lesions varying from pearl-white nodules to definite papillomas projecting 2 to 3 cm. above the surfaces were encountered. They were definitely circumoral and were located at or near the external os. Bleeding occurs as a symptom only if the lesion is traumatized or if necrosis and infection cause partial sloughing. As a rule, papilloma is accidentally observed during examination for pregnancy or at time of delivery. In Case 4 of Edmondson's series, examination for excessive vaginal discharge revealed the condylomatous growth. In Case 6 the lesion was identified during a repair of cervical lacerations following delivery.

Microscopic study of the cervix in these cases reveals three forms: A simple type characterized by simple, broad, deep rete cones between long narrow papillae of stroma. In the second form, hyperplasia is more pronounced and fused thick epithelial masses are arranged about tiny confluent stalks. Grossly gray-white or pearly nodules are present on the cervix. In the third type, true papilloma is formed and large masses of proliferating squamous epithelium are arranged about central stalks from which secondary papillary branching is prominent. In all the forms the microscopic features may simulate carcinoma. Hyperchromatism, irregularity in nuclear size, frequent mitotic figures, vacuolization of cells with bird's-eye formation all confuse the picture. In a case reported by Hill,[4] pregnancy was terminated by classical section because of supposed carcinoma of the cervix simultaneously present. The rapid involution of the lesion rather than the equally divided opinion of four competent pathologists avoided subsequent hysterectomy. The first case in Edmondson's series was treated as carcinoma and the patient received 2,300 mg. hr. of radium. The true nature of the lesion was recognized at a later date.

The youth of the patient, the occurrence of the lesion during pregnancy, and its sharp circumscription about the external os may prevent the erroneous clinical diagnosis of carcinoma. Histologically, though some anaplastic characters are noted, benign papilloma associated with pregnancy does not produce malignant changes uniformly through the epithelial column for many individual cells lack anaplastic character.

*Presented at a meeting of the Brooklyn Gynecological Society, March 15, 1950.

The proper treatment of papilloma has not been established. In Case 2 of Edmondson's series, 800 mg. hr. of radium were applied. After eleven weeks the lesion disappeared. In Case 3, cauterization was employed. In Case 4, three cauliflower growths 2 to 3 cm. in length were removed by division of their pedicles and cauterizing of the bleeding points. In Case 5, the lesion spontaneously regressed. Podophyllum so successfully employed in condylomata acuminata of the vulva and urethra may be of value. It may well be, however, that further observation may prove spontaneous disappearance of the lesion in the postpartum period.

The rarity of cervical papilloma associated with pregnancy, and its diagnostic challenge to the clinician and pathologist warrant the case report abstracted below.

Mrs. L. J., aged 29 years, reported for pelvic examination on Nov. 18, 1947, because of an irregularity of the cervix noted during insertion of a contraceptive diaphragm, which had been used for the past eighteen months. Menstruation was normal. The last period occurred October 1 to 6, 49 days prior to the date of examination, but slight staining was present from October 24 to 27, the date at which her next regular period should have occurred. Pelvic examination revealed a cervix directed posteriorly and presenting a flat, firm but fissured nodule about 0.8 cm. in diameter on its left anterolateral aspect. This projected for 2 to 4 mm. above the adjoining epithelium of the portio. The uterine body was enlarged to the size of a 6 to 8 weeks' pregnancy, and was noted as rounded and softened. A diagnosis of papilloma of the cervix associated with early pregnancy was entertained. Vaginal and cervical smears were negative for the gonococcus and the Wassermann and Mazzini reactions were negative. Examination on Dec. 2, 1947, revealed no change in the lesion. Biopsy was performed and the classical findings of papilloma in pregnancy were noted (Figs. 1 and 2). The epidermoid lining of the portio was markedly thickened and arranged in broad pegs separated by narrow connective tissue septa. In the outer squamous layer parakeratosis was pronounced, with vacuolization of the cells and collapse and shrinkage of the nuclei. The prickle-cell zone was prominent and hyperplastic. Many nuclei were varied in size, shape, and staining intensity. Moderate numbers of mitotic figures were observed. The basal zone was sharply demarcated from the underlying connective tissue stroma which contained a sprinkling of lymphocytes. In foci the basalis was almost in direct apposition with cells of immediately underlying cervical glands. In the basal layer, too, hyperplasia was prominent and mitotic figures as well as variability in configuration of the nuclei were present. Decidual changes in the stroma were not observed.

Antepartum examination on Jan. 27, 1948, showed progression of the lesion. This was kidney-shaped, pearl-gray in color, papillary, and now measured 2 by 1 cm. The anterior and posterior lips of the left side of the cervix were involved. At the external os the lesion was sharply defined. By April 10, the papilloma was larger and softer. The color now was dull gray. On May 27, the lesion extended across the midline to the right and the papillomatous mass, now somewhat more pedunculated, projected 7 to 10 mm. beyond the surface of the portio. The lesion remained stationary in size during the remainder of the pregnancy. Spontaneous delivery of a normal female infant occurred on July 3, 1948. The labor lasted twelve hours and dilatation of the cervix was without incident. Inspection of the cervix after the birth of the infant showed no laceration and no change in the papilloma. The postpartum course was uneventful. Examination on Sept. 28, 1948 (eleven weeks after confinement), showed marked regression of the lesion. The cervix was practically normal except for a slightly elevated gray-white granular zone 8 to 10 mm. on the left anterolateral cervix. By November 29, the lesion had completely disappeared and the cervix was entirely normal.

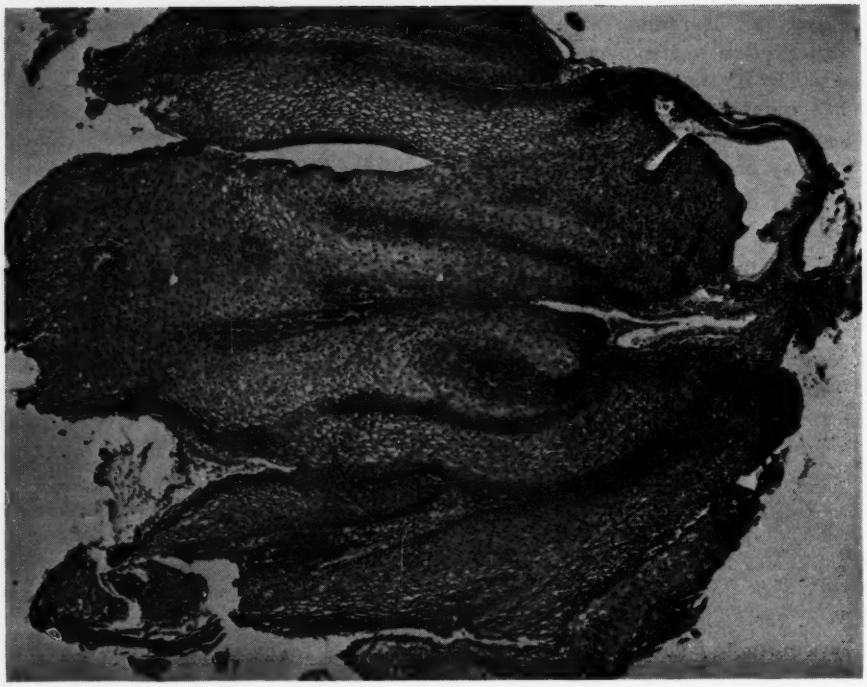

Fig. 1.—Biopsy from nodule of left side of cervix. Large thick pegs of hypertrophic epithelium almost in apposition are separated by narrow compressed papillary columns of stroma. The base of the epithelial columns is sharply defined and on the side is in direct contact with an underlying cervical gland. (×80.)

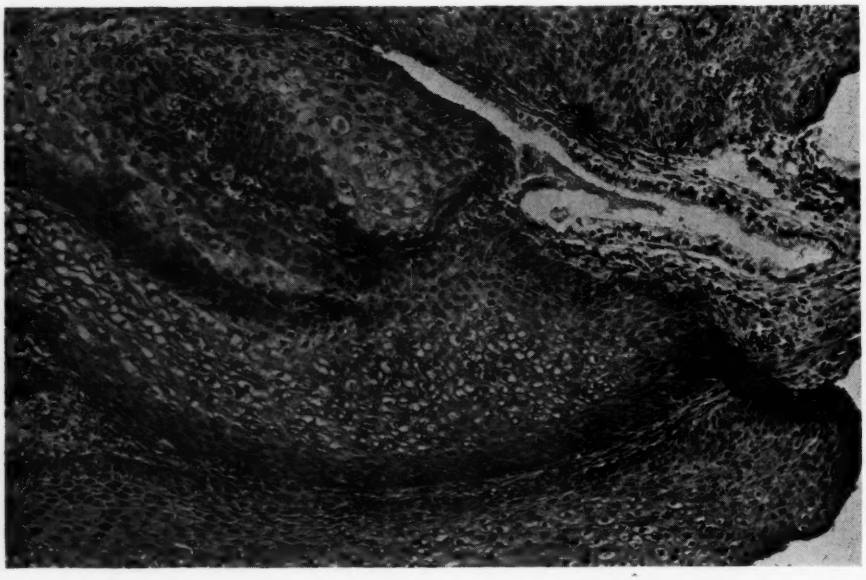

Fig. 2.—Biopsy from the cervical lesion. The thickened, hypertrophied columns of epidermoid epithelium show marked vacuolization of the cells in the squamous layer. The prickle-cell zone is hyperplastic and many of the actively growing cells show variation in size and staining intensity of the nuclei. Mitotic figures are present. On the side, the basal cells are large, fusiform, and numerous. Here, too, mitotic figures are encountered. (×150.)

Summary

1. Papilloma of the cervix associated with pregnancy is a rare lesion. It results from and is associated with the concurrent pregnancy.

2. Papilloma of the cervix has no adverse effect upon the antepartum, intrapartum, or postpartum period of pregnancy.

3. Papilloma of the cervix spontaneously disappears with termination of pregnancy. If no symptoms arise from its presence, no active therapy is necessary for its removal.

4. Clinically and pathologically papilloma simulates carcinoma of the cervix. The morphological pattern of papilloma however is distinctive and thus permits its differentiation from true epidermoid carcinoma.

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1530 PRESIDENT STREET

RUPTURED ENDOMETRIOMA WITH FATAL PERITONITIS

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(From the Division of Gynecology, Pittsburgh Hospital)

A MARRIED nulliparous white woman, aged 26 years, was admitted to the hospital complaining of severe generalized abdominal pain. The present illness was of four days' duration and had started with nausea, vomiting, and diarrhea. At the time of onset she had been examined by her family physician and treated for acute gastroenteritis which was epidemic at the time. The increasing severity of the illness warranted hospitalization. The past history revealed dysmenorrhea since menarche requiring medication and bed rest during the entire period with the exception of the last menses which had ended three days prior to the present illness and which was peculiar in that it had not been accompanied by any pain or discomfort.

Physical examination upon admission revealed generalized abdominal tenderness, rigidity, and absent peristalsis. The breath sounds were accentuated in both bases. On bimanual examination the cervix was found to be patulous and emitted a blood-stained discharge. A tumor mass was palpable in the midline of the true pelvis, approximately 10 cm. in diameter. The uterus and adnexa could not be distinguished. The temperature was 99.4° F. orally, pulse 80, and blood pressure 110/80. Laboratory findings: hemoglobin 80 per cent; erythrocytes 4,030,000; leucocytes 14,500; the sedimentation rate 18 mm. in one hour (Linzenmeier). The Friedman test was negative and roentgenograms of the abdomen revealed distention of the entire colon except the sigmoid.

Ochsner routine for peritonitis was instituted immediately, combined with Wangensteen drainage, and both penicillin and streptomycin were given parenterally. Supportive treatment included intravenous glucose and blood transfusions. Notwithstanding intensive treatment, the patient died fifteen days after admission with a presumptive diagnosis of infected abortion. Permission for autopsy granted.

Autopsy.—The entire peritoneal cavity, with the exception of the splenic area and left paracolic fossa, was filled with a chocolate-colored fluid. The small and large intestines were enormously distended, contiguous loops were adherent by numerous delicate fibrinous adhesions but there were no areas of strangulation. A cystic mass approximately 10 cm. in diameter occupied the normal position of the uterus. The latter organ together with the right tube and ovary were displaced posteriorly and to the left. The interior of the cyst contained fluid which escaped from a small aperture in the capsule. This fluid was of the same type that filled the abdominal cavity.

Microscopic examination of the serosal surface of the uterus, intestines, and liver revealed an inflammatory reaction with loss of the surface epithelium, newly formed capillaries, fibroblasts, macrophages, lymphocytes, and polymorphonuclear leucocytes. The surface epithelial cells, when present, were found to be laden with a golden-brown pigment, probably hemosiderin. Histological sections of the cyst wall demonstrated large amounts of fibrous, connective tissue, ovarian parenchyma, and endometrial-type glands surrounded by small amounts of stroma. The lining of the cyst was a single layer of columnar cells containing the same brown pigment seen in the serosal cells. Bacterial culture of the intraperitoneal fluid revealed no growth in twenty-one days.

A review of the literature reveals eight similar cases in which a spontaneous rupture of large endometrial cysts precipitated acute abdominal symptoms simulating ruptured ectopic gestation or acute appendicitis.[1, 2, 3] This additional case is presented to emphasize the existence of such a clinical entity, the diagnostic problems involved, and the fatal outcome if undiagnosed.

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UNSUSPECTED TUBAL PREGNANCY WITH INTRAPERITONEAL HEMORRHAGE*

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(From the Michael Reese Hospital)

THE patient, a 39-year-old white married woman, gravida iii, para ii, was first seen on Feb. 2, 1950. Her chief complaint was vaginal bleeding of five weeks' duration. The past history was negative except for an uncomplicated appendectomy performed in 1938. She had had two normal, full-term deliveries, the first in 1936 and the second in 1943, and she mentioned that she thought there had been a spontaneous abortion in July, 1949. There was no history of pelvic pain or fever following either of the two deliveries or of the abortion. Menarche occurred at the age of 14 years; the periods had always been irregular, occurring every 5 to 6 weeks, lasting 6 days, profuse for the first 3 days, and with very little discomfort.

When seen in the office on February 2, the patient stated that the last normal menstrual period started on Nov. 15, 1949. On December 25, bleeding began, which lasted for six days; this bleeding simulated the normal menstrual flow. After one day during which there was no bleeding, there was a resumption of the flow. This was rather profuse and continued for three weeks and was followed by spotting for two more weeks. There were no episodes of fainting, nor did the patient complain of either pelvic or abdominal pain.

Pelvic examination revealed a slightly enlarged uterus in third degree retroversion and second degree prolapse, normal-appearing cervix, moderate rectocele, and nonpalpable adnexa. There was some slight tenderness in the right adnexal region. A small amount of bleeding was present in the cervical os. Abdominal examination revealed very slight tenderness in the lower abdomen on deep palpation.

The patient was admitted to Michael Reese Hospital on February 2 with a diagnosis of possible retained ovular tissue or submucous fibroid. Temperature, pulse and respirations, and blood pressure were normal. Urinalysis and Kahn tests were negative. The blood count preoperatively revealed a hemoglobin of 11.4 Gm.; red blood count, 3,500,000; white blood count, 5,400. The differential blood count showed 69 per cent segmented neutrophiles; 22 per cent nonsegmented neutrophiles; 3 per cent lymphocytes; 6 per cent monocytes; the sedimentation rate was 14.

On February 3, operation was performed (Dr. I. F. Stein). Dilatation and curettage revealed almost no endometrium. A vaginal hysterectomy was decided upon with a provisional diagnosis of submucous fibroid or adenomyosis as the cause of bleeding. When the cul-de-sac was opened in the course of the hysterectomy, about 300 c.c. of old and fresh blood were found in the peritoneal cavity. At that time, an unruptured right tubal pregnancy was discovered. The tube was as soft as the adjacent intestine, adherent to the posterior wall of the uterus, and fresh bleeding was noted from the fimbriated end. The uterus, right tube and ovary were removed. Postoperative diagnosis was: unruptured tubal pregnancy, retroverted uterus, second degree prolapse of the uterus, rectocele, and lacerated perineum.

The pathology report was as follows:

Gross: The myometrium is thickened. There is a 2.5 cm. fusiform enlargement near the fimbriated end of the tube. In this area the serosal surface is slightly hemorrhagic. When the tube is opened in this area, a 2-cm. organized clot is seen. This clot is easily

*Presented before the Chicago Gynecological Society, Feb. 15, 1950.

separated from the tube wall. No placental tissue is seen on sectioning the clot. The tube is intact in its entirety. The external surface of the ovary is dull gray and focally hemorrhagic.

Microscopic: Chorionic villi within the tube, simple cysts of the ovary with periovarian hemorrhage, fibrosis of the uterus.

The patient received 500 c.c. of whole blood postoperatively and made an uneventful recovery, leaving the hospital in good condition on her tenth postoperative day.

In view of the unsuspected findings, further probing into the patient's history revealed no symptoms which might have aided in the diagnosis except for the very slight pelvic discomfort she experienced for two weeks when doing very hard physical labor. She had come to Chicago from a small community two hundred miles distant; her physician there had advised dilatation and curettage for the prolonged bleeding which he had assumed was functional in nature. Although she had originally stated that there had been a spontaneous abortion in July of 1949, further questioning revealed that this episode had actually occurred in 1948. There was no history of postpartum or postabortal sepsis.

The tubal swelling was so soft and adherent to the posterior wall of the retroverted uterus that a correct preoperative diagnosis was extremely difficult.

104 South Michigan Avenue

ULCERATIVE VAGINITIS IN A CASE OF ACUTE MONOCYTIC LEUCEMIA

AARON E. KANTER, M.D., AND THOMAS H. MERCER, M.D., CHICAGO, ILL.

(From the Cook County Hospital)

THE patient, a 28-year-old Negro woman, was admitted to the gynecological service at Cook County Hospital on Dec. 27, 1949. She complained of a sore throat and dysphagia of three weeks' duration, with pain in the left upper quadrant and lower abdomen accompanied by fever for two weeks.

An inventory of symptoms elicited the additional symptoms of headache, dizziness, some nausea, and impaired appetite. Frequency of diurnal urination and nocturia were present. The patient was a para 0, gravida 0, with a menstrual cycle of 29 days with a 5-day flow. Her last menstrual period was 17 days prior to admission.

Physical examination revealed a blood pressure of 120/72, a pulse of 102, respirations of 26, and a temperature of 102.8° F. The patient could open her mouth only two centimeters. Fetor oris was present. The tonsils were enlarged, reddish in color, with a necrotic, grayish membrane upon them. The pharyngeal mucosa was inflammed. Marked tenderness of the submandibular area was noted. No hepatosplenomegaly was detected; however, moderate tenderness and rigidity over the left upper quadrant and hypogastrium were present.

Pelvic examination at that time revealed a slight amount of foul brownish vaginal discharge. The introitus admitted two fingers with difficulty and with much pain to the patient. Injection of the mucosa beneath the urethra and at the introitus was marked. The cervix was small, pointed down and forward, somewhat softened, and was tender to touch and motion. The corpus was anterior, normal in size and shape, and tender to touch and motion. No masses were detected in the adnexal regions; however, marked tenderness was present. The cul-de-sac area was exquisitely tender. The fornices were negative. Speculum examination revealed an ulcerated area in the cul-de-sac near the junction of the cervix and the vaginal wall. There was also a beginning ulceration of the posterior lip of the cervix between 6 and 9 o'clock.

A catheterized urine specimen showed two plus albumin. The hemoglobin was 70 per cent (Tallqvist).

A tentative diagnosis of acute follicular tonsillitis, acute pelvic inflammatory disease, cervicitis, and vaginitis was made.

The impression of the otolaryngology department was that of gingivitis and pharyngitis, etiology undetermined. Throat cultures on the patient were negative for beta hemolytic streptococcus.

The patient continued a febrile course with no improvement of her oral condition in spite of antibiotic therapy, chemotherapy, and local agents; however, her abdominal symptoms abated. Subsequent work-up revealed the red blood cell count to be 1,870,000, hemoglobin, 33 per cent, and a white blood cell count of 278,000 with mononuclear cells predominating in blood smears.

A recheck on the patient's condition revealed the cardinal signs and symptoms of fever, tachycardia, pallor, spongy hypertrophied gums, pharyngitis, ulcerative tonsilitis, generalized adenopathy with a then detectable hepatosplenomegaly, thus making the diagnosis of acute monocytic leucemia obvious.

The patient refused any additional pelvic examination or manipulation unless she was "put to sleep." Inasmuch as biopsies, photographs, and an additional pelvic ex-

amination were desired, an anesthetic was administered with trepidation. The patient regained consciousness following the anesthesia of cyclopropane, oxygen, and ether, but presented the appearance of peripheral vasomotor collapse. Blood of her particular type was not immediately available in the blood bank. Plasma and oxygen were administered but the patient succumbed three hours after the anesthetic.

Biopsy specimens were reported as "microscopic sections reveal a vascular granulation tissue infiltrated by lymphocytes and large numbers of mononuclear cells with large vesicular nuclei, some of them slightly indented. This picture can be compatible with a monocytic or myelogenous leucemia."

Department of Book Reviews

EDITED BY PHILIP F. WILLIAMS, M.D., PHILADELPHIA, PA.

Review of New Books

Gynecology

The Staff of the Vincent Memorial Laboratory has been long in giving birth to **The Cytologic Diagnosis of Cancer.**[1] The dystocia is understandable for it is a well-organized and authoritative book. The foreword indicates that it is chiefly the work of Mrs. Ruth Graham; in fact, the text resembles a set of notes taken during one of the excellent courses she formerly gave at the Laboratory.

Dedicated to "The Master," Dr. George N. Papanicolaou, the book includes chapters on gynecology, the respiratory tract, the gastrointestinal tract, the urinary tract and pleural and peritoneal fluids. At the end is a chapter on technique as well as a helpful index and a bibliography that appears to be complete.

Although the greater part of this compact volume concerns itself with cytology, the clinician, interested only in the practical aspects of the subject, will find his material at the end of each section. Students of cytology will be grateful for the quality and the novel arrangement of the numerous photos, diagrams, and drawings. Mrs. Deloris MacKinney's colored drawings, although not quite equal to those of Mrs. Hashime Muriyama, are extremely good; students will be materially aided by them. Original and valuable is the chapter on Radiation Changes. Mrs. Graham has made a study of cytologic evidence of radiosensitivity and radioresistance as a guide to the treatment of cervical carcinoma. She has also helped to clarify the frequently troublesome differentiation between benign radiated cells and the cells of early recurrence in the follow-up of patients treated with radiation.

It will be a long time before cytologic terminology is standardized. For cells which Mrs. Graham refers to as "outer basal," Dr. Papanicolaou and others use the term "parabasal." Mrs. Graham's "third type cell," found in many cases of early noninvasive carcinoma of the cervix, appears to resemble one of several types of cells whose nuclear changes Dr. Papanicolaou has labeled "dyskaryosis."

All existing monographs on cytology, including the present volume, Dr. Papanicolaou's, and the one by Drs. Olive Gates and Shields Warren are weak on the crucial subject of the findings in early, noninvasive carcinoma of the cervix. It is chiefly in this curable stage of the disease that vaginal smear cytology can be really lifesaving, not only in routine screening of asymptomatic patients but more especially in those frequent instances in which the tissue biopsy of an early lesion is equivocal or in which the biopsy missed the lesion.

CHARLES T. SNYDER

Dr. Robert Frank said of the first edition of Dickinson's **Atlas of Human Sex Anatomy**[2] that it represented "a pioneer effort to assemble a striking pictorial presentation of the female and male sex organs together with their function." Seventeen years later the same statement can be applied to the second edition and yet one must raise the serious question of whether enough has been revised or enough new added to justify its reprinting.

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[1] **The Cytologic Diagnosis of Cancer.** By the Staff of the Vincent Memorial Laboratory, Vincent Memorial Hospital, Boston, Mass. 229 pages. Philadelphia. 1950, W. B. Saunders Company. $6.50.

[2] **Atlas of Human Sex Anatomy.** By Robert Laton Dickinson, M.D., F.A.C.S. Second edition. 133 pages and 175 plates. Baltimore, 1949, The Williams and Wilkins Company.

Certain anatomical data on the measurements of the male penis have been added. New information is presented on the amount of semen and the size of the reservoir providing for orgasm. Of interest are the added figures of Norma and Norman giving cooperative average dimensions of the American man and woman. Certain of the Kinsey data concerning time of sexual urge and means of outlet provide interesting contrast with the concepts presented in the previous edition.

As a compilation of anatomical facts regarding male and female reproduction this volume contains data nowhere else obtainable. It is splendidly and graphically portrayed. However, when the author ventures into physiology the failure to make use of recent advances is apparent. Thus, the statement that follicle-stimulating hormone is an ovarian hormone is perpetuated and the new data of Hertig and Rock regarding the shortening of the time from ovulation to implantation are not included. The charts regarding time of ovulation date from 1927 and 1931, and thus do not include the data obtained from basal body temperatures or those derived by Farris from the rat test.

The bibliography contains over 400 references carefully selected from the author's vast experience. This alone is a valuable contribution.

LOUIS M. HELLMAN

Diseases of Women[3] is a brief and concise presentation of modern gynecology. Since the ten contributors include some of the most outstanding specialists in the British Isles this book can be taken as an expression of current opinion in that country.

The fifty-four chapters cover the entire range of gynecology. They are fairly amply illustrated although the chapter on operative procedures would benefit by more profuse illustration.

One is most struck by the absence of figures of incidence and cure; and by the complete lack of bibliography. The concision and simplicity of presentation, however, go far to make up this lack.

LOUIS M. HELLMAN

This small but concise volume, **Gynecological Histology,**[4] represents an effort by the author to provide a simple guide to the histology and functional pathology of the human female reproductive organs. Originally the author prepared the book to accompany a catalogue of gynecological slides for use by her medical students. The book is divided into seven chapters as follows: the body of the uterus, cervix, Fallopian tube, ovary, vagina, vulva, and twenty-five pages on the pathology of pregnancy.

Most of the 342 pages are devoted to photomicrographs prepared from the slides in the teaching set used by the Nuffield Department of Obstetrics and Gynecology at Oxford and the University College Hospital in London. The photomicrographs are well chosen and pertinent.

Most of the pictures are self-explanatory but are amplified by a well-chosen text. An endeavor has been made to keep this monograph as clear and simple as possible; therefore, many rare conditions have been omitted, as well as bibliographical references. However, the tumors of the ovary are very completely illustrated.

The author is a practicing obstetrician and gynecologist who knows her subject well and has presented the essentials of gynecological pathology in a pictorial manner with clarity and simplicity. The book should prove useful and have a special appeal to medical students and house officers struggling with the basic science fundamentals of gynecology and obstetrics.

GEORGE W. ANDERSON

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[3]**Diseases of Women.** By Ten Teachers, under the direction of Clifford White, M.D., B.S., (Lond.) F.R.C.P. (Lond.) F.R.C.S. (Eng.) F.R.C.O.G. Edited by Clifford White, Frank Cook, and William Gelleat, Eighth edition, 461 pages, 170 illustrations. Baltimore, 1949, The Williams and Wilkins Company.

[4]**Gynecological Histology.** By Josephine Barnes, M.A., D.M. (Oxford), M.R.C.P. (London), F.R.C.S. (Eng.). Assistant, Obstetric Unit, University College Hospital; Assistant Obstetrician and Gynecologist, Elizabeth Garrett Anderson Hospital. 242 pages, 162 illustrations. New York, 1949, Grune & Stratton, Inc. $6.50.

The second edition of **Biological Actions of Sex Hormones**[5] by Burrows of London is a completely revised and up-to-date summary of the world's literature on the subject. In his review of the first edition in 1946 the late Dr. R. T. Frank predicted the book would become a standard source of reference. When the first edition sold out, the author and publishers decided against a mere reprinting. The present edition contains references dated 1948.

The book concerns itself chiefly with laboratory experiments upon small animals; however, numerous references to purely clinical considerations are interspersed. It has a chapter on the gonadotrophins of the pituitary and the placenta and another on the sex hormones of the adrenal cortex. The sections dealing with the actions of androgens and estrogens upon extragenital organs and tissues are especially good. The index of the book, considered alone, is valuable, for it presents an itemized picture of the enormous volume and variety of experimental work that has been done. The list of author-references contains well over 2,000 items and this small fraction of the sum total appears to have been well chosen.

CHARLES T. SNYDER

This volume, **Contributions to Embryology,**[6] includes nine beautifully illustrated articles covering widely separate subjects in the field of embryology, an indication of the range of studies supported by this foundation.

Adaptation of Uterine Blood Vessels and Accommodation of the Products of Conception. S. R. M. Reynolds.

This study of vascular adjustments in the rabbit uterus to the increasing size and changing shape of its contents shows first stretching, then separation of greatly crowded vessels. Two collateral vascular areas are described which permit the uterine wall to receive an adequate blood supply despite the changing pressures within. This paper forms a further contribution to our knowledge of the physiology of the uterus which the author has already so considerably enriched.

The Early Development of the Human Vertebral Column. E. Carl Sensenig.

This is a detailed and precise study of the formation of the components of a vertebra, tracing its history from the appearance of the earliest rudiments at about age 22 days (2.17 mm., 7 somites) until vertebral growth is well advanced at 80 mm. It summarizes the development observed in 88 human embryos of the valuable Carnegie collection, and describes exactly how each vertebra is derived from the inferior half of one sclerotome and the superior half of the next, with the subsequent definition of the neural arches and rib shafts.

The Palatine Ridges of Primates. Adolph H. Schultz.

The author surveys the occurrence and distribution of the transverse ridges in the lining of the hard palate in 29 species of mammals in general and in the monkeys, apes, and man particularly. He concludes that the primitive common ancestor of primates probably had 7 to 9 pairs of such ridges; while howler monkeys and chimpanzees tend to increase the number, the gorilla and man have them reduced, man averaging just over four, chiefly occurring on the anterior part of the palate.

Rate and Significance of Atresia of the Ovarian Follicle of the Rhesus Monkey. Somers H. Sturgis.

The author has made a careful cytological study of the degeneration of follicles, and by correlating the changes with cyclical production of progesterone has tried to account for it. But this is inadequate to explain the factors that initiate atresia just prior to ovulation. However, it is suggested that the theca interna of these degenerating follicles

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[5]**Biological Actions of Sex Hormones.** By Harold Burrows, C.B.E., Ph.D., F.R.C.S. 615 pages. New York, 1949, Cambridge University Press. $8.50.

[6]**Contributions to Embryology.** Volume XXXIII, Nos. 213 to 221. Carnegie Institution of Washington Publication 583. 186 pages, 31 plates. Washington, D. C., 1949. Paper, $8.50; cloth, $9.25.

may produce estrogen at a time when it is of vital importance to bring about ovulation and luteinization of the follicle destined to rupture.

Observations on the Cervical Mucosa of the Rhesus Monkey. Clara Eddy Hamilton.

The cervical mucosa in the ovulatory cycle of this monkey affords evidence that the height and secretory activity of its cells are closely correlated with blood-estrogen level. The influence upon the cervix of castrates injected with Amniotin, stilbestrol, progesterone, and testosterone, alone and in combinations, was investigated; all indicate that the cervix is particularly sensitive to estrogen.

Double Ureters and Associated Renal Anomalies in Early Human Embryos. Lawrence R. Wharton, Jr.

Two cases of these defects in human embryos of 9.0 and 9.6 mm. are described and illustrated with a brief discussion.

The Vascular Pattern of the Endometrium of the Pregnant Rhesus Monkey. Elizabeth Mapelsden Ramsey.

A satisfactory morphological answer is given to the question, "How do the endometrial blood vessels react to the mechanical and hormonal stimuli of an implanting and and developing ovum?" Excellent colored illustrations of reconstructions are given, and a good bibliography.

Developmental Horizons in Human Embryos (Fourth Issue): A Review of the Histogenesis of Cartilage and Bone. George L. Streeter.

In this posthumous paper, a great embryologist has completely described the development of the humerus, a typical long bone, from the origin of the arm bud to the formation of bone and definitive marrow. The beauty of this series of papers defining developmental horizons will place it among the classics of embryology, a fitting memorial to a well-loved teacher.

Two Human Ova of the Pre-villous Stage, Having a Developmental Age of about Eight and Nine Days, Respectively. Arthur T. Hertig and John Rock.

Two valuable additions to the slowly growing group of very young human embryos described in the literature are here presented. The detailed records and exceptional illustrations show these to follow the developmental pattern already established largely from the earlier observations of these authors.

STEPHEN CULVER WILLIAMS

Obstetrics

In **The Long Pelvis,**[7] Prof. Kirchhoff has made a detailed study of the high assimilation pelvis, which he regards as a much-neglected congenital anomaly. It is felt that this condition is a dangerous complicaiton of pregnancy.

The term "high assimilation" refers to the inclusion of the last lumbar vertebra, either functionally and/or structurally, in the sacrum. All sorts of connections between the last lumbar vertebra and the sacrum may occur, from a mere lengthening and thickening of the transverse process to complete bilateral bony union. The position of the last lumbar vertebra is also important. It may continue the lumbar curve, or be a part of the sacral curve, without regard to the degree of bony connection between it and the sacrum. Moreover, the transitional vertebra may occupy a spatial position intermediate between the lumbar and sacral curves.

Assimilation is regarded by the author as representing a beginning adaptation on the part of the organism to the upright posture. Three major types of high assimilation pelvis are distinguished. In the first, or transitional pelvis, the abnormality is confined to the pelvic inlet. In these pelves there is a transitional vertebra between the lumbar and the sacral regions. This results in an excessively high sacral promontory or the formation of a double sacral promontory. In the second type of high assimilation pelvis,

[7]**Das Lange Becken.** By Prof. Dr. Heinz Kirchhoff, Chief of the City Women's Clinic, Lübeck, Germany. 144 pages, 111 illustrations. Stuttgart, Germany, 1949, Georg Thieme Verlag.

the assimilated fifth lumbar vertebra is anatomically and functionally a part of the sacrum, and the general configuration of the latter is maintained. The pelvis, however, has been lengthened by the height of one vertebral body and the sacral promontory is too high. In the third type, or assimilation canal pelvis, there is a partial or complete assimilation on the last lumbar vertebra in association with a straight or convex sacrum. The result is a diminution of midpelvic dimensions and the formation of a narrow area at a plane inferior to that of the true conjugate.

The assimilation canal pelvis closely resembles, in its general dimensions, the pelvis of the infant and young child. The canal form of pelvis persists until the sixth year of life; thereafter, the sacral promontory becomes more noticeable and the hollowing of the sacrum at midpelvis is progressively more marked. The author regards the persistence of the canal type of pelvis as part of a generalized failure of development in the individual, which may not infrequently be associated with hypoestrinism.

The elevation of the sacral promontory reduces the value of the angle between the ventral surface of the sacrum and the plane of the inlet. Normally, this angle is in the vicinity of 110°; if it falls to 80° or below, severe complications may be expected. In such a pelvis, the vertex cannot enter the inlet, even if the inlet measurements are within normal limits, because an excessive lateral angulation of the neck of the fetus would be required. Consequently, even if the uterine contractions are of good quality, they serve only to drive the vertex against the symphysis and not into the pelvic inlet. If the vertex does enter the pelvic inlet, posterior rotation of the occiput is common.

The frequent location of the transitional vertebra in a plane midway between that of the lumbar curve and the sacral curve leads to the formation of a double sacral promontory. If there is any diminution of the anteroposterior pelvic dimensions, this may have serious import. In the assimilation canal pelvis, the lack of sacral concavity impedes the normal internal rotation of the vertex and deep transverse arrest results. If rachitic changes should be present, the complications may be further accentuated.

The author feels that about 28 per cent of women have some degree of assimilation pelvis. He has made a complete study of parturition in 212 cases of high assimilation pelvis and reports an incidence of 51.5 per cent spontaneous delivery, 22 per cent cesarean section, 18 per cent forceps, 1.9 per cent maternal mortality, 7.1 per cent fetal mortality, and a twenty-four-hour average duration of labor.

The high incidence of operative interference in this series appears unusual. Other authors, both in this country and in Germany, concur in the general incidence of this anomaly, but they do not regard it as an important cause of dystocia.

The book is profusely illustrated with diagrams and roentgenograms and a complete bibliography is given. This work is a very careful and thorough presentation of the etiology and anatomy of assimilation pelvis.

BRUCE A. HARRIS, JR.

The Artificial Interruption of Pregnancy,[8] the first two editions of which were prepared by the late Georg Winter, has been completely revised by Dr. Hans Naujoks. The book is divided into three sections, dealing with medical indications, nonmedical indications, and methods of interruption of pregnancy. Under the first heading practically every possible medical complication of pregnancy is discussed, including psychiatric and neurologic conditions. Each condition is considered from the point of view of clinical manifestations, etiology, and effect upon gestation. In general, the author's approach is conservative; abortion is indicated, however, in most of the conditions discussed, if exacerbation or progressive deterioration occurs during pregnancy.

Although a definite indication for abortion does not occur in hyperemesis, the appearance of signs of toxicity, including a pulse greater than 100, temperature above 40° C., or icterus is an indication for abortion. Impetigo herpetiformis, acute yellow atrophy, progressive retinitis, retinal separation, renal deterioration, hydatidiform mole, severe pro-

[8]**Georg Winter: Die Künstliche Schwangerschaftsunterbrechung.** By Prof. Dr. Hans Naujoks, Director of the University Women's Clinic, Frankfurt A.M., Germany. Third edition, 131 pages. Stuttgart, Germany, 1949, Ferdinand Enke Verlag. Price 10 DM.

gressive bilateral pyelonephritis, uncontrollable diabetes, and uncontrollable toxemia of pregnancy are all cited as indications for abortion.

In carcinoma of the uterus, therapy is to be directed only toward the carcinoma without thought for the infant unless the latter is viable. In such a case, treatment may be preceded by cesarean section.

If a pregnancy has been complicated by continued bleeding in the first trimester, the author favors interruption if the hemoglobin has fallen to 50 per cent or less or if complete bed rest and conservative treatment do not stop the bleeding after several weeks' observation. Missed abortion is regarded as an indication for emptying of the uterus.

In discussing pulmonary tuberculosis, the author concludes that abortion may be indicated in a restricted number of cases, which include the bronchiogenic and hematogenic forms of the disease, the exudative forms, and those of the productive forms showing a great tendency to progression during pregnancy. Abortion for tuberculosis of the lungs should be done only during the first four months of pregnancy.

Valvular heart disease may be treated expectantly if compensation is maintained. However, if decompensation supervenes, the pregnancy should be interrupted at once. This is particularly true in mitral stenosis. In kyphoscoliotic heart disease, pregnancy should be interrupted if decompensation has ever been present in the nonpregnant state.

Among the psychoses, manic depressive states constitute no indication for abortion. Schizophrenia should be treated by interruption only if exacerbations have occurred during previous pregnancies.

In organic brain disease, abortion may be indicated after recovery from cerebral hemorrhage or if such a hemorrhage has occurred during a previous pregnancy. Multiple sclerosis may be treated by interruption of pregnancy if the patient's condition deteriorates during pregnancy or if an exacerbation occurs during the first month of gestation. Otosclerosis may be regarded as an indication for abortion if rapid diminution of auditory acuity, especially with labyrinthine manifestations, takes place early in pregnancy, or if strong hereditary tendencies to the disease are present in both parents.

Among the nonmedical indications, the author discusses eugenic, social, and legal conditions. In general, abortion is not indicated even if both parents are feeble-minded. Social difficulties cannot be solved with the curette. In difficult cases a decision can be made only after evaluation of the entire medical picture. In pregnancies following rape, the indication for abortion is determined by the state and not by the physician.

In the earlier months of gestation, the author favors interruption of pregnancy by dilatation of the cervix and mechanical evacuation of the uterine contents. Up to the third month of gestation, dilatation to No. 10 to No. 11 Hegar will suffice for adequate curettage. Hygroscopic dilators (laminaria) may be left in place for twenty-four hours prior to curettage. After the second month, emptying of the uterus following dilatation should be accomplished with the finger or a blunt instrument. After the fourth month of gestation, abortion may be accomplished either by metreurysis or by hysterotomy. The author favors vaginal hysterotomy unless other operations, such as tubal sterilization, are concurrently necessary. In such a case, a miniature abdominal section is preferable.

Although many authors are quoted, a complete bibliography is lacking in this monograph. The text is comprehensive, and the author recognizes that every case must be decided upon its own merits.

BRUCE A. HARRIS, JR.

The second edition of Prof. Martius' **Textbook of Gynecology**[9] is especially directed to students and practicing physicans. In the author's own words, the text is kept as short as possible and the relationship between gynecology and the entire field of medicine is stressed.

There are ten chapters. The presenting complaints of the gynecological patient are given, followed by a description of their etiology, diagnosis, and management, rather

[9]**Lehrbuch der Gynäkologie.** By Prof. Dr. Med. Heinrich Martius, Director of the University Women's Clinic, Göttingen, Germany. Second edition. 418 pages, 445 illustrations. Stuttgart, Germany, 1949, Georg Thieme Verlag.

than a discussion of gynecologic disease from the standpoint of the individual organs in order. The last two chapters deal with gynecological urology and gynecological orthopedics. In the chapter on urology, diseases of the kidneys and ureters are omitted, the discussion being confined to the lower urinary tract.

The chapter on gynecological orthopedics is especially welcome. It includes a discussion of the mechanics of the upright posture and the physical signs differentiating gynecologic backache from other types. Special attention is paid to the assimilation pelvis. The chapter closes with the admonition that backache in women is not to be assigned arbitrarily to genital disease without a thorough inquiry into the dynamics of the entire organism.

The book is profusely illustrated, many of the illustrations being in full color. There are no photographs, but many of the drawings achieve photographic accuracy. The diagrams are excellent. Many conditions are illustrated by diagrams showing exactly what might be expected to be palpable on bimanual examination. This feature would be especially welcome to students or those inexperienced in pelvic diagnosis. Therapeutic considerations in this volume are extremely detailed. This feature should make the book valuable to the practicing physician.

Altogether this is a compact, beautifully illustrated volume containing a wealth of information in a readily available form. It is a worthy companion to the author's other works in this specialty.

BRUCE A. HARRIS, JR.

In the latest **Fundamentals of Operative Delivery,**[10] Dr. August Mayer has revised his previous work with minor rearrangements of the material presented. As before, the book is intended mainly for students and practicing physicians, and does not purport to deal with controversial or purely academic obstetric subjects.

Beginning with the definitions of lie, position, and station, the author leads the reader through a practical review of labor, conditions and indications for operative interference, forceps, version, outlet operations, the metreurynter and colpeurynter, various destructive operations on the child, a brief consideration of cesarean section, and finally puerperal operative manipulations.

Although the book is well conceived there are definite deficiencies. For example, general considerations of pelvic architecture and radiographic methods of study are inadequately covered; the varieties and technique of cesarean section are absent. Certainly American obstetricians would object to the long description of the use of high forceps. On the other hand, the outline of the determination of prognosis of a given patient in labor, and the discussion of destructive operations are excellent.

The book is of interest to the practicing obstetrician in this country but certainly cannot supplant the several excellent texts now extant in the English language on the same subject matter.

WARREN R. LANG

The monograph, **Pregnancy—A Special Study,**[11] by Dr. Schröder, contains well-documented data on the normal and pathologic physiology of pregnancy as a basis of understanding the pregnancy toxemias. The author reviews clinical material from the University of Leipzig for the years 1922 through 1947. Incidentally, the booklet was published in the Soviet Zone of Germany.

The anatomic physiologic relationships of mother and fetus are briefly reviewed. Nausea and vomiting of pregnancy are discussed, and surprisingly enough the author finds it necessary to interrupt 5 to 6 per cent of cases of hyperemesis gravidarum.

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[10]**Grundzüge der operativen Geburtsleitung.** By August Mayer, Direktor der Universitäts—Frauenklinik Tübingen. Fourth and fifth editions with 127 illustrations. Stuttgart, 1949. Ferdinand Enke, Publisher.

[11]**Die Schwangerschaft—Ein Besonderer Leistungsanspruch. Beiträge zur normalen und pathologischen Physiologie der Schwangerschaft als Grundlage Zum Verständnis der Schwangerschafts—toxikose.** By Prof. Dr. Robert Schröder. Leipziger Universitäts—Frauenklinik. 122 pages, 16 illustrations. Georg Thieme, Leipzig, 1949.

Late pregnancy toxemias are divided into: (1) The "functional" form, the true pregnancy toxemias; (2) the "organic," which grouping includes renal, hepatic, cardiac, and cerebral disease in various combinations; and (3) "special" unusual manifestations such as skin lesions, tetany, anemia, acromegaly, polyneuritis and psychiatric disorders. With reference to normal pregnancy and pre-eclampsia and eclampsia, the details of changes in blood composition, circulation, and volume, capillary permeability, electrolytic balance, hormonal influences, metabolic considerations, vitamin and mineral requirements, hepatic and renal function are excellently outlined. A brief review of the author's results and an extensive bibliography of over 500 references mainly from the German literature conclude this work.

WARREN R. LANG

The 1949 issue of the **Year Book of Obstetrics and Gynecology**[12] is twenty-six pages larger than is 1948 counterpart. In general it follows the same plan as the previous issue with the exception that an entire section is devoted to the problem of ectopic pregnancy in both the gynecologic and obstetric divisions of the book. The book is made up of abstracts of the current literature (October, 1948, to August, 1949) arranged by subject matter, with editorial comments which cover a wide variety of topics. The selection of papers has been wise and most of the abstracts have been concisely written. The editorial observations are to the point and add greatly to the value of the book. This book will be greatly appreciated by all obstetricians and gynecologists.

GEORGE A. HAHN, M.D.

After paying essential tribute to the pioneer work of Grantley Dick Read, Helen Hergman, Helene Deutsch, and Edmund Jackson, Herbert Thoms takes up the manner for natural childbirth in his new and excellent monograph, **Training for Childbirth.**[13]

Dr. Thoms emphasizes the fact that natural childbirth is not painless childbirth even among noncivilized people, but that it can be made relatively free from the distress which hinges upon lack of understanding, faulty emotional control, fear, and anxiety. It can be made a rewarding experience to the mother if the goal of her efforts is kept constantly in mind and if she is rewarded by the early observation and intimate contact with the product of her labors.

To accomplish these purposes this manual of methods emphasizes "the education of the mother, the use of certain exercises primarily aimed at relaxation, and the importance of sympathetic and continued attention during labor." Of all of these factors the author and his associates consider that "support" of the patient during labor by the obstetrician and by competent nursing personnel is the most important consideration in the success of their program.

For those who are interested, this monograph presents the first compact, as well as complete, compendium of information on this subject published in the United States, and provides a working guide for those who would practice in their own clinics the philosophy of physiologic reproduction. Instructions which are given to patients are described in detail. Sources from which illustrative atlases can be secured are listed. Types of exercises are well illustrated. And the simple methods of conduct of labor and analgesic and anesthetic agents which are occasionally used are clearly set forth. The additional interesting comments of several disciples of Natural Childbirth are quoted, and the reader is convinced that these observers sincerely believe that their patients have had significant and perhaps important experiences.

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[12]**The 1949 Year Book of Obstetrics and Gynecology.** Edited by J. P. Greenhill, B.S., M.D., F.A.C.S., Professor of Gynecology, Cook County Graduate School of Medicine; Attending Gynecologist, Cook County Hospital. 629 pages with 132 illustrations. Chicago, 1950, The Year Book Publishers.

[13]**Training for Childbirth. A Program of Natural Childbirth With Rooming-In.** By Herbert Thoms, M.D., Professor of Obstetrics and Gynecology, Yale University School of Medicine; Obstetrician and Gynecologist in Chief, University Service, Grace-New Haven Community Hospital. 109 pages with 15 illustrations and diagrams. New York, 1950, The McGraw-Hill Book Company, Inc.

Dr. Thoms presents the results in 546 vaginal deliveries in which the operative instance is 6.1 per cent in occiput-anterior, 29.2 per cent in occiput-posterior, and 30.0 per cent in breech presentation. Some form of analgesia was used in 55 per cent of the primigravidous patients. In the majority of instances this analgesia was restricted to not more than 125 mg. Demerol. In 30 per cent of the multigravidas, analgesia was employed.

Anesthesia for delivery was used in 43 per cent of the primigravidas and 53 per cent of the multigravidas. This anesthesia generally took the form of interrupted or continuous nitrous oxide and oxygen with procaine infiltration anesthesia or pudendal block.

The materials and content of this monograph are the more convincing because the author makes no attempt to convert the reader to his own philosophy of obstetric management. The observations are frankly and lucidly stated and he "that runs may read." One formulates the opinion, however, that there is a very considerable segment of the female population of this country who desire methods of obstetrical care such as Dr. Thoms has described, that these individuals should be given the opportunity of natural childbirth and of intimate association with their babies in the "rooming-in program," and that in some subtle fashion the natural relationship between mother and child is being enhanced rather than thwarted at an early period in family life. It would appear to the reviewer of this work that those who are very critical of this present trend in obstetrics may have to correct their point of view, and instead of asking what is advantageous about natural childbirth, question themselves as to what ultimate advantage to mother or offspring lies in deep analgesia and complete anesthesia for delivery.

The monograph of Dr. Thoms is an indication that the obstetrical specialty in this country may be coming of age when the obstetrician manifests an interest in something more than the mechanics of his art and begins to speculate upon the relationship of his particular field to human welfare in general.

THADDEUS L. MONTGOMERY

This monograph, **Essentials of Obstetrical and Gynecological Pathology,**[14] represents an enlargement of a very fine first edition on this subject. The total number of illustrations has been increased and the quality of these illustrations greatly improved. As the authors point out in the preface, the teaching of special pathology has become of major importance in hospitals having departments of obstetrics and gynecology. Systematic training in pathology, although desirable, is frequently not available in the prolonged education of the average obstetrician or gynecologist. Intelligent therapy of the woman patient demands the mastering of the clinical pathological fundamentals and relationships. With these specific principles in mind, extreme wordiness and personal opinions were avoided. A straightforward tabulation of existing knowledge was attempted.

The first chapter is devoted to the technical handling of surgical specimens for histopathologic preparations. The histology of various types of epithelia and types of glands found in the female generative tract are appropriate introductory chapters. The next eight chapters deal with the specific problems of the pathology of the vulva, vagina, cervix, endometrium, myometrium, Fallopian tube and ovary, and of endometriosis. The final chapter summarizes the pathology of pregnancy.

The photographs and photomicrographs are well selected and pertinent, and add to the clarity of the concisely presented text. The volume is beautifully bound and printed, with almost one illustration on each page.

This book covers the breadth and scope of the field of obstetrical and gynecological pathology. Since there are relatively few treatises in the English language on this special phase of pathology, the book is timely and should be well received. It will furnish a starting point for students and house officers requiring an introduction to the functional pathology of the female generative tract.

GEORGE W. ANDERSON

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[14]**Essentials of Obstetrical and Gynecological Pathology.** By Robert L. Faulkner, M.D., F.A.C.S., Assistant Professor of Gynecology, Western Reserve Medical School, Associate Gynecologist, University Hospitals of Cleveland; and Marion Douglass, M.D., formerly Assistant Professor of Gynecology, Western Reserve Medical School. Second edition. 357 pages, 300 illustrations. St. Louis, 1949, The C. V. Mosby Company. $8.75.

Miscellaneous

According to the author, "orgone" is primordial cosmic energy, represented in the living organism by "biological energy," "discovered by Reich between 1936 and 1940." "Biopathy" is defined as "a disturbance of the biologic function of plasmatic pulsation in the total organism." These and numerous other definitions are required to thread one's way through a maze of pseudoscientific experiments and observations which purport to prove that "the cancer cell is in reality a product of the many PA bions which were formed from blood or tissue cells, as a defense against the local autoinfection with T- bacilli." (T- bacilli, which are the product of a putrid disintegration of organic or living matter, stimulate in other organic or living matter the formation of "blue bions.") This is followed by a chapter on the treatment of cancer patients with "orgone therapy" (supplying the organism with repeated doses of concentrated orgone). The concluding section deals with cancer biopathy as a problem of sexual sociology. It is stated that the local cancer affection is a result of a disturbed sex economy of the organism, which may be combated by making a radical change in the sexual hygiene of the total population, but meantime should be treated by means of the "orgone accumulator" made by the Orgone Institute Research Laboratories, Inc., Orgonon, Maine.

The apparent enthusiasm of the author of this fantastic volume[15] and its superficial "scientific" presentation wrapped in a new technical terminology are of the type which may entice many gullible lay adherents to join the cult.

A. E. RAKOFF

Dr. V. Mary Crosse has had a great deal of experience with the setting up of Premature Stations throughout England and **The Premature Baby**[16] details the manner in which premature children may receive the utmost care. In the Foreword, Dr. Leonard G. Parsons says, "Although during the last two or three decades the death rate in children from one month to 12 months of age has shown a dramatic reduction, it has not been substantially affected in children under one month, and particularly in those under one week old. Thus, out of every 1,000 children born alive in each year from 1905 to 1909, on the average 81 died between the ages of one month and one year and 41 died in the first month, whereas, in each year from 1938 to 1942 the number of deaths between one month and one year was reduced to 25, but although there was a reduction to 28 deaths in the first month, the deaths in that month are now higher than those in the remaining part of the first year; moreover, more than one-half of these children who died in the first month of life were born prematurely."

Dr. Parsons goes on to say that fourteen years ago Dr. Mary Crosse commenced an attack on the second of these two problems, that is, the reduction of mortality among premature babies and the results of her experiment have been so encouraging that the book is a detailed account of her results and how she achieved them. There are eight chapters which are well worth reading by anyone who is practicing obstetrics or pediatrics and a detailed technique is reviewed. There is not any part of the book which could not be read with a great deal of interest for it has been procured at the source by Dr. Crosse and her clinical management of these very important patients is very well done. The book is highly recommended and should be in every hospital library.

MARIO A. CASTALLO

A study of the sex life of **The Single Woman**[17] is presented. The data were obtained from 1,078 case histories recorded from 1883 to 1933 by a well-recognized gyne-

[15] **The Discovery of the Orgone. Vol. II. The Cancer Biopathy.** By Wilhelm Reich, M.D. Translated by Theodore P. Wolfe, M.D. 405 pages, 46 figures. New York, 1948, Orgone Institute Press, Inc.

[16] **The Premature Baby.** By V. Mary Crosse, O.B.E., M.D., D.P.H., M.M.S.A., D. (Obstet.) R.C.O.G. Second edition. 167 pages, 14 illustrations. Philadelphia, 1950, The Blakiston Company. Printed in Great Britain.

[17] **The Single Woman.** By Robert Latou Dickinson and Lura Beam. 469 pages. Baltimore, 1934, The Williams and Wilkins Company. $4.00.

cologist and obstetrician. Details are given about many individual patients and twenty-five tables have been compiled.

The information given in this book, though objective in part, reveals the concepts of sexuality held by the authors. Completed in 1933, it does not record the influence of education during recent years, but will serve well for comparison with present studies. The perusal of this work by those interested in the life of the unmarried woman from the sexual viewpoint will be profitable. The attitudes of the authors are commendably stimulating toward investigation of patients' thoughts and behavior in regard to their genitals. The life-time experience of a competent physician in such investigation as recorded in this book should be of great value to those so stimulated, whether they be psychologists, sociologists, or physicians. The concepts, the methods of investigation, and the psychological therapeusis are approved by the reviewer.

DAN W. BEACHAM

Dr. Friedberg has divided his excellent volume on **Diseases of the Heart,**[18] their diagnosis and treatment, into six parts. In the first part he discusses circulatory failure. There is a complete discussion of the law of the heart, including cardiac reserve. He has a chapter on treatment of congestive heart failure which goes into great detail in regard to rest and the use of dietetic measures (including restriction of sodium and fluid). The use of digitalis and related drugs is thoroughly discussed. Indications, contraindications, preparation to be used, and dosages are all clearly explained. The mercurial diuretics, their uses, and mechanisms of action are discussed. Oxygen therapy is presented in detail as well as the use of surgical measures such as the removal of serous effusions and phlebotomy. A chapter on acute circulatory failure, including shock, syncope, and sudden death, which may well be very useful to the obstetrician and surgeon is in this part.

Part Two discusses the cardiac arrhythmias, Part Three the coronary circulation and disturbances in cardiac blood supply, Part Four the structural abnormalities of the heart, and Part Five the etiologic forms of heart disease. The sixth part of the book, dealing with special problems in heart disease, is relatively new in textbooks of this type. There is a very comprehensive discussion of pregnancy and heart disease including pathologic physiology, diagnosis, prognosis, management, and indications for discouraging pregnancy, and for performing therapeutic abortion. A chapter is given over to surgical procedures in cardiac patients, including estimation of cardiac risks, type of operation, and choice of anesthesia. There is also a rather complete discussion of preoperative, operative, and postoperative care of cardiac patients. The last chapter in the book is devoted to insurance and medicolegal problems in cardiac disease. In this chapter a discussion of the Workmen's Compensation Laws and heart disease is included. The average doctor, knowing very little about insurance and medicolegal problems, will find this chapter exceedingly interesting.

The whole book is written in a clear, concise manner and is well indexed and paragraphed. I know of no single volume which would be as complete and up-to-date a reference in cardiovascular matters as Friedberg's Diseases of the Heart.

J. R. KITCHELL

The Cry and the Covenant[19] is a novel about the tempestous and pathetic Semmelweis, who is now universally recognized as the discoverer of the etiology and prophylaxis of childbed fever. Thompson has chosen a challenging subject. A philosopher might have written a dissertation on genius, and whether an entirely sane person ever makes worth-while advances in world knowledge. Our author, with a well-developed sense for the dramatic, has written an intensely gripping story of one of the great episodes in medical history. He has given not only an excellent picture of midwifery in the 18th

[18] **Diseases of the Heart.** By Charles K. Friedberg, M.D., Associate Physician, Mt. Sinai Hospital, New York; Lecturer in Medicine, Columbia University. 1081 pages with 79 figures. Philadelphia and London, 1949, W. B. Saunders Company. Price $11.50.

[19] **The Cry and the Covenant.** By Morton Thompson. 469 pages. Garden City, New York, 1949, Doubleday and Company, Inc. Price $3.50.

Century, when puerperal fever was a major cause of death, and of the great Vienna hospital that was becoming the teaching center of medicine for all the world, but more especially of a sensitive, morbid, underprivileged mind struggling with a great problem. He does not undertake to answer the question of whether the task of making the world accept his thesis caused Semmelweis' final mental breakdown, or whether Semmelweis' mental aberration delayed the universal acceptance of his discovery. He simply tells the story—and a truly exciting story it is. He brings out several facts, if facts they be, that are not generally known. One is that Semmelweis' sudden and abrupt return to Budapest was precipitated by Klein's "forgery" of the record, changing Semmelweis' appointment as "Privat-docent" so as to limit his teaching to demonstrations on the manikin. The second is that the wound that caused his death was deliberately self-inflicted and not accidental.

There are some inconsequential, but seemingly unnecessary, errors in the book. He speaks repeatedly of Simpson of London instead of Edinburgh. He intimates that Richard Bright understood pancreatic diabetes. Had this been so Eugene Opie would have been saved a lot of search of the literature when, in 1900, he reported his case of hyaline degeneration of the islands of Langerhans, associated with diabetes. The professor of chemistry is made to boast of the knowledge of molybdenum, tungsten, columbium and selenium. This knowledge could not have been great before the discovery of the electric furnace. Semmelweis' birth is graphically described as being presided over by *two* male midwives dressed in women's clothes and wearing heavy veils to conceal their beards. In the Middle Ages, men were executed for impersonating women in order to gain knowledge of the birth process. At a later date there are stories of consultants being introduced into the delivery chamber on their hands and knees to avoid upsetting the patient, but it is hard to believe that *two* disguised men-midwives were called to attend a normal case as late as 1818. Finally, and I am through carping, the author's translation of the German "Herr" to "sir" is irritating. It seems to me it would have been better to have left the "Herr" untranslated or to have omitted it entirely.

These minor criticisms should not deter one from reading this valuable and enjoyable account of a great event in a rather neglected era, the pre-Lister era.

M. Pierce Rucker

The title of this book, **Hormones in Clinical Practice,**[20] would indicate that it is intended chiefly as a guide to the practitioner in matters of endocrine therapy, and the and the author in his preface expresses this as one of his chief purposes. That it will be helpful in this respect I do not doubt, although therapy receives far less consideration in this book than does the physiology of the various endocrine glands. This is certainly not a fault, because endocrine therapy is not a matter of rules-of-thumb, but must be based on at least an elementary knowledge of the functions and interrelationships of the various hormones. The book contains a wealth of closely packed information on these points, so that it constitutes an excellent synopsis of endocrinology. The discussion of many controversial points is probably unavoidable, but it inevitably detracts somewhat from the clarity of presentation, and would, it seems to me, lessen its value to the practitioner-reader. To be perfectly frank, the reviewer feels that the book might appeal especially to those who are already well versed in endocrinology, and who would enjoy turning its pages and brushing up on a very systematic synopsis of the subject.

Reference was made above to the fact that rules-of-thumb have no place in endocrine therapy, and yet one gets the impression that this is just about what the author offers under the heading, "Clinical Application and Approximate Dosages," included in each chapter, with usually no discussion as to limitations, possible abuses, and hazards. For example, he sets forth, for the treatment of menopausal symptoms, a short list of

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[20] **Hormones In Clinical Practice.** By H. E. Nieburgs, M.D., Research Associate, Department of Endocrinology, and Assistant Professor, Department of Oncology, University of Georgia; lately Research Endocrinologist, Department of Obstetrics and Gynecology, British Postgraduate Medical School. 368 pages. New York, London, 1949, Paul B. Hoeber, Inc. Price $5.50.

estrogens with their usual dosage, but he says nothing as to the usual dispensability of any estrogen treatment at all, its frequent wrong employment for symptoms not genuinely menopausal, the harmfulness of too continuous treatment, and the hazard of producing postmenopausal bleeding. In other words, he does not make plain that endocrine therapy is only a part, and certainly not the most important part, of the management of the menopause. Similar criticism can be made of the therapy of many other indications discussed in the book. This, to my mind, is the chief fault of this otherwise excellent work.

The chapters on The Anterior Pituitary and Ovarian Hormones will naturally be those of greatest interest to the gynecologist and obstetrician. Incidentally, while there is a brief description of ACTH, there is no mention of the contribution of Kendall and Hench, which has made that hormone the most glamorous of the past year. Chapter XVI is devoted to a listing of the commercial preparations of the various hormones which are now available. The reviewer took the trouble to count all the estrogenic preparations of all types (hormonal and nonhormonal, oral, hypodermic, etc.) in this list, and you may be interested to know that he found the number to be 101.

Finally, one of the most valuable chapters in the book (Chapter XV) to the laboratory worker, rather than to the clinician, is devoted to Diagnostic Procedures, comprising nearly a hundred pages describing the various tests utilized in laboratories of endocrinology. An excellent bibliography appended to each chapter greatly enhances the value of the volume. All in all, this book impresses me as of definite value to those interested in endocrinological problems, including those so often encountered in gynecological practice.

EMIL NOVAK

In **X-ray Treatment**[21] the author traces the history of the x-ray back to the study of the vacuum tube, begun in 1838 by Heinrich Geissler in Germany. He mentions the discoveries of Plücker (1859), Hittorf (1860), and Sprengel (1865), which led to the work of Crookes (1875). Hertz (1892), Leonard (1893), and Weiderman (1895) continued along the path which finally led to Roentgen's announcement in 1895. In the light of subsequent events it seems likely that these investigators had been working with x-rays since 1859 without realizing it.

In January, 1896, Dr. Grubbé developed a severe dermatitis on his left hand from x-ray exposure. He was seen by a number of physicians at this time. Since the x-ray produced such changes in the normal tissue, it was decided to see what effect x-ray would produce on diseased tissue. On Jan. 29, 1896, a patient with advanced cancer of the breast was the first patient ever knowingly treated with x-radiation. It is interesting to note that Dr. Grubbé first treated a case of carcinoma of the uterus, using a speculum, in 1899; in 1902 he successfully treated several uterine cancers, using a combination of external and speculum therapy.

In the course of his work Dr. Grubbé's body was exposed to the deleterious effect of the early uncontrolled x-ray. Because of the injury that was done he had to have over eighty operations in an attempt to repair the damage.

This book should be read by all who are interested in radiation therapy. It emphasizes again that certain modes of therapy now in use were arrived at only through human sacrifice.

GEORGE A. HAHN

The book for the laity, **For the New Mother,**[22] by Mrs. Hardcastle and illustrated by Shirley Tattersfield is extremely well done. Mrs. Hardcastle brings to the new mother not only her experience as a mother herself but also those of a competent housewife and nurse which is a rare combination indeed. The chapters are thirteen in all and some of

[21] **X-ray Treatment—Its Origin, Birth and Early History.** By Émil H. Grubbé, B.S., M.D., F.A.C.P., formerly Professor of Roentgenology, Chicago College of Medicine. 153 pages and 51 illustrations. St. Paul and Minneapolis, 1949, The Bruce Publishing Company.

[22] **For the New Mother.** By Mildred V. Hardcastle, R.N. Illustrated by Shirley Tattersfield. First edition. 163 pages. Philadelphia, 1948, John C. Winston Company.

the more pertinent ones are Easing Into a Schedule, The First Three Months With Baby, You—Tied Down or Growing Up With Baby. This last mentioned chapter is extremely good and is one which may be read for a great many practical suggestions by almost any mother at any time of her raising of children. This chapter also goes into detail on how to become a person growing up with her family, instead of a drudge in a household, and is well worth reading by anyone.

There is a chapter entitled For Emergency Only, which is well worth while; it gives the new mother many helpful hints on what to do in emergencies and explains many of the things that keep new mothers, as well as older ones, on this side of panic when they do occur. Mrs. Hardcastle handles this with a great deal of good sense as she does the remainder of her material.

The book actually takes up where the doctor and nurse in the hospital leave off. It is modern, written simply and completely, and will take many of the cares and scares out of the first year with that first baby. It is to be recommended most highly.

MARIO A. COSTELLO

Published under the auspices of the National Committee on Maternal Health, Incorporated, this book, **A Thousand Marriages,**[23] is one of a series on medical aspects of human fertility. Its subtitle is, "A Medical Study of Sex Adjustment." The material for this book was gathered from the case histories of 1,098 patients followed for an average of seven years, some of the patients being followed from youth to advanced age. It presents a straightforward discussion of brides, frigidity (one of the best chapters), passion, dyspareunia, adjustment in marriage, fertility, windows, a control group of two hundred cases, maladjustment, fear, substitution and compensation, conflict of education, and separation and divorce. Chapter 20 is devoted to a summary. In addition to being medical, this book is sociological and psychological.

WOODARD DAVIS BEACHAM

[23] **A Thousand Marriages.** By Robert Latou Dickinson and Lura Beam, with a foreword by Havelock Ellis. 507 pages, 23 tables, 14 figures. Baltimore, 1931, reprinted 1949, The Williams & Wilkins Company. $4.00.

Erratum

American Board of Obstetrics and Gynecology

The address of Dr. Russell R. de Alvarez, given in the list of Associate Examiners of the American Board of Obstetrics and Gynecology, in the April issue of the JOURNAL, as Portland, Oregon, should have been

Department of Obstetrics and Gynecology
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